DOCUMENT RESUME

ED 429 227 CE 078 488

TITLE	Standards for Creating Multimedia Learning Modules for Low Literacy and Limited English Proficient Adult Learners.
INSTITUTION	California State Univ. Inst., Long Beach.
SPONS AGENCY	Office of Vocational and Adult Education (ED), Washington, DC.
PUB DATE	1999-02-00
NOTE	78p.
PUB TYPE	Reports - Descriptive (141)
EDRS PRICE	MF01/PC04 Plus Postage.
DESCRIPTORS	Adult Basic Education; Adult Literacy; Classroom Techniques; Curriculum; Delivery Systems; Distance Education; Educational Needs; Educational Technology; English (Second Language); Evaluation Criteria; *Learning Modules; Learning Processes; *Limited English Speaking; *Literacy Education; *Material Development; Multimedia Instruction; *Multimedia Materials; *Standards; Student Characteristics; Teacher Student Relationship; Teaching Methods

ABSTRACT

This document is a working paper from Cyberstep, a 3-year project during which five literacy service innovators are collaborating to identify practices for educating English-as-a-second-language learners and adults functioning at low literacy levels, extend the use of technology to facilitate learning, and provide practical tools for educators. The document begins with an introduction that includes background information about the project, the working paper, the project partners and products, and the learning venues for which the project products are being designed. The body of the working paper focuses on four sets of issues: learner issues (service populations targeted by Cyberstep, development of a descriptive framework to distinguish different kinds of learners, need for learning materials to provide multiple ways to access and work with information and learn in context); instructional issues (principles of adult learning, learning frameworks, distance learning, learning categories, learning management); development issues (importance of supporting the evolution of the traditional model of learning by persuasive reasons for change, benefits of using converging digital technologies for parallel development of multimedia products); and standards issues (templates and standardization, content standards, assessment standards, technology standards, interface standards, management system standards, template standards). (MN)

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ED 429 227

Standards for Creating Multimedia Learning Modules for Low Literacy and Limited English Proficient Adult Learners

California State University Institute

Task 1 Deliverable

Cyberstep activities and products are funded by a contract with the U.S. Department of Education, Office of Vocational and Adult Education. However, the content does not necessarily reflect the position of that department or of the U.S. Department of Education.

February 1999

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Credits

This working paper is a collaborative effort of the development partners. The principal contacts for the development partners are:

California State University Institute
400 Golden Shore, Suite 116
Long Beach, CA 90802
Contact: Dennis Porter
510.644.0437
porter_d@pacbell.net

Los Angeles Unified School District
Los Angeles Technology Center
3721 W. Washington Blvd.
Los Angeles CA. 90018
Contact: Dr. Hugo Pedroza
323.735.4279
hpedroza@lausd.k12.ca.us

Sacramento County Office of Education
9738 Lincoln Village Drive
Sacramento, CA 95827
Contact: John Fleischman
916.228.2580
jfleischman@sac-co.kq2.ca.us

Adult Literacy Media Alliance
96 Morton Street
New York, NY 10014
Contact: Dr. Marian Lapsley Schwarz
212.807.4230
mschwarz@edc.org

Aguirre International
480 East 4th Avenue, Unit A
San Mateo, CA 94401
Contact: Dr. Ed Kissam
640.373.4924
ekissam@aiweb.com

Significant content contribution was provided by Dr. Ed Kissam, Dr. Jo Ann Intili and Dr. Heide Wrigley of Aguirre International; Dennis Porter and James Powrie of California State University Institute.

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Summary

This working paper begins to define the theoretical and design standards underlying the development of Cyberstep's ABE, literacy and ESL multimedia instructional materials for adults functioning at low literacy levels.

This section summarizes the standards findings and policy issues articulated to date.

Learning Venues

- With rapid changes in the workplace and increasing complications in everyday life, the need for anytime, anyplace, and any pace adult basic instruction is ever more critical.
- Cyberstep materials will be designed for use in multiple venues including school, home, workplace and community center. The ABE and ESL materials will be designed as stand–alone curricula as well as support for an organization's existing curricula.
- The materials may be used as part of self-paced, independent study or with mediated instruction. Materials will be designed to facilitate ongoing learning, allowing learners to pick up where they left off when moving from one venue to another.

Learner Issues

1. Learners targeted by Cyberstep fall within two broad service populations: English speakers with low levels of literacy and those with limited English speaking skills.
2. Cyberstep researchers will develop a descriptive framework to provide practical useful ways to distinguish different kinds of learners. This will help guide learners to segments of both ESL and ABE learning materials, which are particularly relevant to their interests, needs, objectives, and learning style based on a profile they themselves generate.
3. The Cyberstep learning materials will provide multiple ways to access and work with the information, focusing on contextual learning.

4. The instructional design will provide multiple methods to navigate within and between the learning materials.

5. The designs will encourage learners to formulate, test, and refine explicit hypotheses. Critical thinking skills will be refined through activities and exercises where learners put forward "ideas" about topics and issues of interest, including how best to learn and practice new skills. Learners will practice testing ideas on their own (using checklists or simulations built into the materials) and in dialogue with other learners (on-line or in classrooms).

6. Cyberstep materials will include elements designed to engage learners in self-reflection and to remind them that they constantly confront choices as to how to manage resources including their own time, energy, and personal support networks as they seek to build their skills.

7. A standard set of learning style competencies will be identified and strategies and methods that promote developing these competencies will be woven into Cyberstep products.

Instructional Issues

1. The SCANS framework is particularly appropriate for development of Cyberstep curriculum materials because the SCANS competency areas provide a practical but powerful "checklist" for developing materials that stimulate and sustain contextual learning.

2. The Cyberstep ESL designs will focus on English-language skills development and anchoring curriculum to social contexts that are likely to be encountered by the targeted learners and where they can routinely practice and build proficiency. There will be an emphasis on promoting agility in coping with a broad range of communication contexts and in extending new English-language skills to increasingly challenging situations.

3. Distance learning can augment traditional classroom education and provide educational access to remote learners who cannot attend traditional classes or who are not enrolled in educational institutions but can benefit from self-directed learning.

4. Information technologies increasingly allow a rich interactive distance learning experience that can complement the interactions possible in a traditional classroom and, where used for self-directed learning, provide a structured sequence of learning activities and guidance to allow learners to progress on their own.

5. Seat time based reimbursement hampers multi-modal ABE and ESL instruction. Cyberstep can incorporate learning management utilities

that facilitate accountability in use of these materials and tracking how learners may combine self-directed learning at home, in class, and in other venues such as the workplace.

6. Cyberstep developers will design for three learning categories: formal (in class), self–directed and mediated distance learning. Design parameters will support all three from the beginning.
7. Cyberstep materials will be designed to support active and persistent learning.

Learning Management

1. Learning management involves understanding with learners where they are now, clarifying where they want to go, working with them over time to see what they've accomplished, and assisting them to determine where they want to go next.
2. Learning management should be part of the learning process and not an awkward, distracting, add-on. Many learners fear testing and anything that smacks of it (like record keeping and management).
3. Cyberstep learning management utilities will provide learners with a way to track their progress, for example, by reviewing a virtual portfolio of their work.

Development Issues

1. The evolution in the traditional model of learning must be supported by persuasive reasons for change. The potential for increased time on task and increased flexibility of instructional technologies and learning contexts are the key reasons.
2. Parallel development of multimedia products using converging digital technologies can greatly reduce the cost to create and distribute high quality products for low literacy learners.
3. The convergence of presentation media and development tools into a single digital format permits far more cost-effective development and the ability to efficiently repurpose data for multiple products and formats. Once data (text, images, video, sound) are in digital format, they can be readily transferred to paper, tape, videotape, CD-ROM/DVD, or Internet based data and new formats envisioned for the foreseeable future.

Standards Issues

1. A central design principle is to create development templates based on standards for course content and assessment, user interfaces, technology tools, and the educational management system.

2. Curriculum cross-walks will indicate how specific competencies that are covered in Cyberstep learning materials relate to identified frameworks (e.g. SCANS, EFF). Skills development priorities will be identified with careful consideration to 21st century information-handling demands as identified in relevant educational policy such as the National Education Goals.

3. The products will cover print, video, CD-ROM, WWW and WebTV technologies. The advantages of DVD in relation to CD-ROM and the potential for other interactive TV options similar to WebTV will be evaluated.

4. Products targeted to different learner groups and addressing different learning needs, will invariably require unique design considerations. But in order to facilitate mixing modules from various Cyberstep products and using standardized development templates, key design elements will be specified and will remain constant across products.

Conclusion

The Task 2 working paper will refine instructional and curriculum design issues as a logical extension of this paper. As a work in progress, it will be refined over time as circumstances require and permit.

About the Project

The Cyberstep project is funded by the U.S. Department of Education, Office of Vocational and Adult Education, under the Adult Education Technology Board Agency Announcement competition. It is part of the Department's effort to identify successful practices for educating adults functioning at low literacy levels, extend the use of technology to facilitate learning, and provide practical tools for educators.

The three-year project is a collaboration of five literacy service innovators that will result in the development of a set of products targeted to Adult Basic Education and English as a Second Language learners. As part of the development process, the project will establish a set of product standards and production tools that will facilitate rapid and cost-effective creation of additional materials by educators without requiring high levels of technical expertise.

The products and systems will facilitate anywhere, anytime and any pace learning. This is particularly important because the low-income adults who have the greatest need for ABE and ESL instruction are typically faced with a daily challenge just to keep roof over head and food on the table. They have little time or resources to expend on education or "life long learning." Educational institutions that assist this group invariably face limited resources and must devise creative means for delivering instruction and facilitating learning. So Cyberstep products and systems will support multiple learning venues and strategies, including in-class and distance instruction, mediated and self-directed learning.

The approach to product development follows an "assess, design and build" model based on contemporary adult learning theory, projections of technological trends, practical strategies for efficient multimedia product development, and "real world" user assessment and product testing. The development team is committed to the principle that Cyberstep products will be highly useful for learners, educators and administrators alike, today, and in the foreseeable future.

The project includes continuing product assessment and evaluation. However, because of the high cost of multimedia product development, the first phases of the project emphasize a thorough grounding in adult learning theory and the establishment of educational principles and design standards prior to full initiation of product development. This initial work is far from academic in nature. It is a way for the collaborators to establish common approaches to product development based on specific standards, which will in turn facilitate additional new product development.

This "systems approach" to creating Cyberstep products and the building of tools for ongoing development is integral to the project as a whole. Although each of the project's instructional products will have direct use by adult learners and adult education institutions, each is also intended as a proof of concept and testing bed for a set of learning principles and development procedures that will inform follow-on development.

The project will proceed in the following phases:

1. Specification of a theoretical pedagogical approach to identifying and meeting adult learner needs among various subgroups within the low-literacy adult learner population.
2. Identification of a set of standards to be used for product development that are based on the project's adult learning theory and understandings of target learners' needs and capacities.
3. Creation of prototypes and final products based on user testing, feedback and evaluation.
4. Distributions of products, publication of project documentation, provision of access to the project's development tools, and initial developer training.

About this Document

This document is a working paper primarily for project use – serving the purpose of focusing the efforts of the project partners on establishing a common theoretical basis for all subsequent development. It lays the groundwork for the specification of concrete product standards and development procedures that follows in the second phase.

The document will be revised over time as our theories, initial products and procedures are tested and refined under real world conditions. It will be published on the project's web site and will be available for download by interested parties.

This document raises as many questions as it answers. This is intentional. The development of multimedia instructional materials for adults with low functional literacy and limited English skills – particularly materials that support distance learning – is a complex and rapidly evolving endeavor with a limited history, few guidelines, and no broadly agreed upon standards.

Our product design and development process will rely on equal measures of planning, discovery and assessment. This document does not attempt to resolve long standing pedagogical debate about the most effective ways to teach ABE and ESL students, but it does engage the issues and begins the process of clarifying what approaches the Cyberstep developers will take and what learning strategies the products will support.

Some technologies that support advanced interactive and streaming media components of the products have only been available for the past year. The significance of these technologies and their impact on the potential learning environment is not fully realized. This document begins the process of projecting technological innovations and specifying the project's approach to technology, but it is an ever-changing snapshot that must be constantly updated.

Reader comments are welcomed and will assist in further refinement of the paper. A comment form is available on the Cyberstep web site: ***www.cyberstep.org***

Overview

With rapid changes in the workplace and increasing complications in everyday life, the need for anytime, anyplace, and any pace adult basic instruction is ever more critical.

The challenge to effectively use technology to provide affordable, high impact adult basic education and literacy instruction is of more than academic interest. It speaks to some of our nation's most critical issues:

- Stemming the increasing gap between the haves and have nots.
- Increasing the opportunity for all Americans to be self-sufficient.
- Improving literacy skills required to actively participate in the nation's civic life and democratic processes.
- Increasing family literacy and knowledge of positive social, psychological and physical health practices.

Many adults, who are under the most pressure to improve their basic literacy skills to become self-sufficient, are those currently receiving public assistance. Ironically, the nation's welfare reform initiative may have made this already challenging task even more difficult.

Instead of the traditional "educate, train and place" model, welfare recipients are expected to get a job ("Any job is a good job.") first and only afterwards obtain remediation and training. This reversal of the concept of "school-to-work" to "work-to-school" means that some form of distance education may be the principal manner by which people in this needy population can access educational services. Distance learning resources may play a critical role in social policy since even successful participation in a single basic skills course may not be enough. Ongoing economic shifts and new technologies will undoubtedly require recurring investments in skills building.

Few low-income adults, particularly those needing adult literacy services, have the ability to sustain long-term attendance in sequential courses offered in traditional settings. Although there is a high demand for ABE, GED and ESL courses, many participants drop out without completing what is traditionally considered a full course of study. The emerging notion of lifelong learning assumes that these skills and abilities can be obtained on demand throughout a lifetime, as

circumstances require and permit. This requires rethinking in national policy and in the design of adult basic education and literacy instruction.

As literacy skills become ever more necessary to obtain stable and personally rewarding jobs, the need for more diversified and accelerated ways of learning increases. Just as rapid changes in the nation's economy and social policy cause many low-income individuals to fall further behind, our educational institutions are also hard pressed to keep up with rapid technological and social policy changes.

Our schools are by nature and design slower to change than the overall society. If adult education is to remain relevant to the needs of individuals with low to moderate levels of literacy, it must change – perhaps fundamentally – not only in the method of delivering content, but in the nature of the content itself.

Rapidly Changing Educational Contexts

In addition to using advanced technology to bolster instruction in the classroom, schools must devise new ways to support learning in different venues including the workplace and home. Instruction must be presented in adult contexts that apply to specific learners' interests. Learners must perceive that the knowledge and skills to be gained will directly affect the quality of their lives and warrant their efforts to overcome difficult challenges to pursuing an education.

In order to accomplish this, educators must continue to expand the definition of what constitutes teaching and learning. In the twenty-first century school, the classroom extends beyond building walls to include diversified learning sites and instructional methodologies. The teaching role is less didactic and more a coaching function – one that coordinates multiple instructional sources including print, video and computer-based media, delivered over a world wide network of digital resource servers. Tutors, peers, supervisors, and other family members are consciously designed into the learning process. Active learning incorporates projects and working with groups of other learners to accomplish personal and community tasks. Individual assessment and "real time" feedback are an integral part of learning, helping to target instruction, trigger additional support and accelerate learning.

All of these approaches to teaching and learning are being practiced to some extent in educational institutions across the country. However, in most cases, teachers and administrators are hampered from implementing new strategies because of the lack of appropriate instructional materials. To help fill this gap, Cyberstep will produce materials that support a diversified range of instructional strategies required to implement effective twenty-first century adult education programs.

Reflecting Contemporary Instructional Principles

Cyberstep products will reflect contemporary instructional principles by supporting self-paced and mediated learning, offering a wide choice in content and learning modes, and by addressing real life concerns of adult learners. A contextual learning approach will be emphasized as essential for an effective learning program.

The products will incorporate rich multimedia content that can be customized to meet unique learner interests and needs. Learners will have opportunities to test out their understanding of concepts and performance against real world criterion based on self-assessment, games, and collaborative work and learning environments.

Multiple products will be developed for print, video, CD-ROM/DVD, and the Internet from the same source materials to provide a consistent, recognizable curricular resource that can be used in almost any setting – low-tech or high-tech. This will allow many of the materials to be used immediately by school districts with limited budgets and then seamlessly upgraded as they develop their technological infrastructures.

By creating an Internet component for all of the products, course content will be readily available to anyone with access to a computer and the Internet. By incorporating WebTV[1] technology standards in the reference design for the web-based products, they will be accessible to those with limited incomes and negligible technical skills through the use of low cost television top Internet converter boxes.

Development Objectives

The project objectives are to:

- Produce six sets of multimedia instructional materials of interest to adults functioning at low literacy levels.[2]
- Make it possible to access those materials from nontraditional settings including homes and workplaces.
- Define a set of standards for creating low literacy adult multimedia learning modules.
- Develop WWW and CD–ROM authoring tools to rapidly create learning materials for adults functioning at low literacy levels.

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[1] WebTV (Web Television) is a low cost Internet access system that uses a device about the size of a VCR that attaches to a television and plugs into a phone line. Although it does not have the power of a computer, initial costs are significantly lower and the technology is easier to use for people who are more familiar with televisions and VCRs.

[2] Those who would score between 5 and 8 on a standardized test, or likely be level 2 on the NALS for ABE, and those who are high beginning English learners for ESL.

Partners

The project is a collaboration of experienced adult education developers, analysts and educators.

Each partner has principal responsibility for developing one or more products, but all partners share responsibility for adopting overall product standards including design and utilization of a consistent user interface, establishment of mechanisms to facilitate integration of materials, and compliance with management system standards.

California State University Institute

The California State University Institute (CSUI) is the lead organization, responsible for managing the contract with the Department of Education and coordinating the efforts of the other partnering organizations.

CSUI administers multiple research and development projects and is the lead agency for the California Distance Learning Project (CDLP), one of the largest state supported new educational technology projects in the country. Many of Cyberstep's design and technology strategies stem from this project started in 1995 and continuing to at least the year 2000.

Sacramento County Office of Education

Sacramento County Office of Education (SCOE) is responsible for creating one set of products as well as development tools to be used by all of the partners. SCOE is the developer and operator of the Outreach and Technical Assistance Network (OTAN), the nation's premier online resource for adult education materials. OTAN has led in the creation of a variety of online instructional resources, including a unique partnership with the Cable News Network (CNN) to create learning resources online using CNN news stories.

Under the Cyberstep Project, SCOE will expand the use of CNN video resources to produce interactive CD-ROMs, a project Web site, and enhanced WebTV site to provide literacy instruction in the context of current events.

Los Angeles Unified School District

Los Angles Unified School District (LAUSD) has the largest enrollment of non- and limited-English speaking students in the country. Because of the lack of affordable, quality commercial products for ABE and ESL students, they are also one of the largest developers of instructional

course materials for teaching English-as-a-Second Language and adult basic education, including print, video and multimedia products.

LAUSD will team with CSUI to produce a multimedia series of 20 videotapes and related print, CD-ROM, WWW and enhance WebTV products targeted to high-beginner English language learners. The products are an outgrowth of LAUSD ESL video activities and the Latino Adult Education Services (LAES), a project of the CSUI.

The materials may be used as a complete course or to supplement existing courses. Language content will be taught in the context of real life concerns and the interests of recent and long-term immigrants. The products will support development of higher order thinking and problem solving skills as described in SCANS competencies. They will meet English language competency standards established by the State of California and other states to facilitate use in the classroom.

Adult Literacy Media Alliance

Adult Literacy Media Alliance (ALMA), a project of the Education Development Center (EDC), is currently producing a 26 episode national television series for adults with low to moderate literacy levels. The curriculum takes a problem-solving, life skills approach to literacy challenges, and involves such activities as filling out applications, communicating with children's schools, creating a budget, evaluating the claims of advertisers, and using a dictionary. ALMA will create a Web site and enhanced WebTV site based on the television series. Each of the products will include a variety of interactive lessons, tests and teacher resources that expand on the video content.

Aguirre International

Aguirre International (AI), a multi-disciplinary research and management consulting firm with extensive experience in adult education research and minority populations will provide formative evaluation support to Cyberstep. In addition to its work with product designers in testing early prototypes of Cyberstep materials, Aguirre International will be actively involved in developing the conceptual framework for learner assessment and learning management. A special focus of this research will be the unique demands and opportunities involved in fostering self-directed lifelong learning and in developing "versatile instructional resources" which can be used in a broad range of learning venues.

WebTV Networks Inc.

WebTV Networks, Inc., a wholly owned subsidiary of Microsoft, Inc., has committed to being a full partner in our project. WebTV is a mix of software and hardware that turns the Web into a medium for low-cost mass entertainment and, potentially, highly interactive distance learning.

The WebTV system consists of a set-top device about the size of a cable-TV box that plugs into a phone line and a TV or VCR. Output from the box goes directly to the TV screen and the quality of text and images is superior to standard broadcast television. The recently released WebTV Plus offers increased interaction, plus a 1.08 GB hard drive that allows for storage and playback of full frame, full speed video downloaded over the Internet. Embedded links in these videos and traditional videotapes allow for simultaneous viewing of video source material and connection to a related site on the Internet. WebTV Networks will donate a computer server and software to manage content and will provide software and hardware engineering assistance. All of the video and Web-based products developed by the partnering organizations will support WebTV interactivity.[3]

[3] Over 1 million WebTV boxes have been sold and a number of school districts are distributing WebTV boxes to students. WebTV enabled products now have an immensely expanded market. The latest version of the Windows operating system (Windows 98) incorporates WebTV for Windows, which allows PCs with video inputs to use the programming created for WebTV.

Products

Cyberstep products include tools for learners, teachers and product developers.

The project's eight core products are:

1. CD-ROM and World Wide Web Authoring Tools

Two sets of software authoring tools will be developed to aid nonprogrammers in developing multimedia learning materials. One set will be for the World Wide Web (WWW) including WebTV. The other set will be for CD–ROM and DVD[4] development. The initial purpose of these tools will be to facilitate creation of Cyberstep products. Ultimately, the tools will be made available to the educational community to assist other educators and developers to create cost-effective multimedia educational materials that meet consistent standards for content and usability. The Sacramento County Office of Education will have primary responsibility for development of the authoring tools, but all project partners will participate in this design and testing.

2. CNN Literacy Resources on the WWW

The California Distance Learning Project, a project of the California State University Institute, and the Sacramento County Office of Education, have partnered with CNN San Francisco to make topical news items available for adult literacy classroom use over the Internet. OTAN has rewritten a wide variety of news stories so that they can be read, heard or viewed (via the use of "streaming media" technology). These resources will be expanded and enhanced under this project.

3. CNN Literacy Resources CD-ROM

WWW based CNN learning resources will be organized into more formal course content and published on a CD–ROM for classroom and home use. This will allow faster access to audio and enriched and expanded video components as well as the incorporation of an auditory feedback component for language and vocabulary practice. The CD–ROM will also incorporate links to the web site to provide hybrid multimedia learning resources.

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[4] CD-ROM technology is under transition to DVD (Digital Versatile Disk) format. DVDs are the same size as CD-ROMs but hold substantially more data and are optimized for video presentation. This is advantageous for presenting material from videotapes but it is not clear how rapidly the technology will become standard on computers and in home use. It is likely though, that within the project's three year development period, DVD will become a cost-effective platform for presenting interactive ABE and ESL video and exercises.

4. ALMA Enhanced Web Site for ABE Learners

The Adult Literacy Media Alliance has completed 13 half-hour television programs with ancillary print materials that are currently being broadcast and distributed in different parts of the country. They are now developing another 13 programs. The curriculum stems from three years of extensive national research into what adults at the pre–GED level want and need. ALMA will create an enhanced Web site to enrich the learning opportunities. The Web site will leverage the considerable investment already made in research and content creation by building on the gallery of characters and situations developed for the TV series.

5. Video Series for Beginning ESL Learners

The Los Angeles Unified School District, with design support from the California State University Institute, will produce a 20 part series of videos and related print materials for the beginning ESL learner. The product will be keyed to California and other ESL competency standards and reinforce SCANS competencies and foundation skills as applied to real life situations and concerns.

6. Beginning ESL CD-ROM/DVD

Video, audio, and the ancillary print materials from the 20 part ESL video series will be used to create interactive CD–ROMs for the beginning ESL learner. These CD–ROMS will support multiple language tracks to assist the beginning ESL learner to comprehend course content and will include interactive exercises and assessments as well as oral feedback to assist learners to practice new skills.

7. Beginning ESL Web Site

The ESL CD-ROM instructional modules will be repurposed for delivery on the WWW. Video and audio segments will be reduced so they can "stream" (send digital video directly to the screen rather than requiring that it be first downloaded). Among the more exciting features will be the ability to interact with other learners in real time and asynchronously. If technology permits, video conferencing capabilities will be added. SCOE is a reflector site for Internet teleconferencing and is evaluating how this technology can support distance learning.

8. WebTV Enhanced Web Sites

The WWW products will be designed and tested for use in home learning via WebTV. The CNN Learning Resources, the Adult Literacy Learning Materials, and the Beginning ESL Learning Materials will be pilot tested for WebTV use. The recently released WebTV Plus receiver expands TV viewing choice and control while providing TV and Web content integration.

Learning Venues

Cyberstep's multimedia learning tools will expand experimentation and early adoption of multimedia models for low literacy adult instruction.

These instructional technologies will empower learners and help them assume responsibility for their own learning. They will require active engagement through interaction with the learning technologies. They will be designed with feedback and query features to monitor progress. And they will enable the learner to have increased control over the learning environment. They will also empower teachers to assume a variety of instructional and support roles both in the classroom and as guides in a distance learning program. The following table illustrates the wide variety of potential learning venues supported by Cyberstep products.

Proposed Product Learning Venues	20 Part ESL Video Series and Print Materials	ESL CD–ROM	ESL WWW Materials	CNN Literacy Learning Resources on the WWW	CNN Literacy Learning Resources on CD-ROM	Enhanced ABE Learning Resources on the WWW	WebTV Pilot Tests
Classroom	yes	yes	yes	yes	yes	yes	yes
Classroom Supplement	yes	yes	yes	yes	yes	yes	yes
Learning Center	yes	yes	yes	yes	yes	yes	yes
Community Center	yes	yes	yes	yes	yes	yes	yes
Literacy Center	yes	yes	yes	yes	yes	yes	yes
Volunteer Program	yes	yes	yes	yes	yes	yes	yes
Home	yes	yes	yes	yes	yes	yes	yes
Worksite	yes	yes	yes	yes	yes	yes	yes
Cable TV or ITFS delivery	yes						

Vignette

California Healthy Families: Literacy needs in the context of health care reform.

Typical of the real-life literacy needs of contemporary adult learners is the need for many educationally disadvantaged families, mostly headed by single women, to apply for coverage under the new health care reform innovation – California Healthy Families – a program designed in part to provide low-cost health insurance to working poor families.

To succeed in this endeavor, Janine Edwards, an Oakland mother of three children, working as a home health care aide, must read a 28-page booklet designed to help her fill out the program application form. To deal with this pamphlet, Janine must sort through an avalanche of information provided her (formatted with various boxes, arrows, and decorative stars in the margins).

She must estimate her income using an economist's algorithm (2.17 x biweekly pay = monthly pay) designed to convert bi-weekly, or monthly, or annual earnings records into a standardized format. She must carefully read definitions of who to include and who not to include in her household and she must determine whether she should pay attention to an enclosed booklet from another program, the Childhood Disabilities Program.

Realistically, Janine must learn to approach this task as a challenge requiring her to use teamwork skills to acquire knowledgeable help in understanding the application (collaborative literacy). She seeks help with the form from her neighbor, Narcisa Fuentes. In exchange, she helps Narci to decide about the relative risks of seeking Medi-Cal which would provide her with free health coverage, but expose her to potential disqualification when she applies for citizenship.

Target Learner Description

The learners targeted by Cyberstep fall within two broad adult education service populations: English speakers with low levels of literacy and those with limited English speaking skills.

In the context of the 21st century information society, "literacy" encompasses a wide spectrum of information-handling competencies. "English-language proficiency" refers to a myriad of communication activities.

Cyberstep product standards are intended to ensure that the educational materials are relevant to a wide range of adult learner interests and needs. We recognize that no single dimension of "competency" or "educational disadvantage" reliably describes an adult learner's actual skills development needs. One of our challenges is to devise a method to describe target learners in ways that go beyond traditional socio-economic or educational taxonomies and more effectively inform content developers to help ensure the relevancy of our products.

The target population for Cyberstep will indeed consist largely of persons with less than 12 years of schooling, people who speak little English, those who are low-income, and mothers who seek to transition from welfare to work.

But these categories are limited and do little to describe the individual interests, predicaments, hopes, idiosyncrasies, and constraints of our target learners. In addition to assisting learners to get a better job or get off welfare, Cyberstep products will support learners who want to foster their children's education, improve their ability to participate in their community, and simply have a more full life.

Toward a Functional Learner Taxonomy

Consequently, Cyberstep standards stress the importance of recognizing and responding to each individual's unique "profile" of personal skills; intellectual, cultural, and social resources; development goals; past learning experience (both in the classroom and life situations); current learning strategies; and constraints on learning or skills-building.

This analytic and descriptive framework for describing, understanding and responding to adult learners in curriculum development, represents a

break from traditional learner taxonomies. We de-emphasize socioeconomic and demographic categories as a basis for describing the targeted populations and give greater emphasis to what may be called a "functional taxonomy" of adult learners.

Educational attainment is an inadequate indicator of learning needs. Cyberstep rejects reliance on gross measures of educational attainment (i.e. years of schooling, highest grade attained) as a valid descriptor of learner ability or "learning needs."

Data from the National Adult Literacy Survey indicate a significant variance in both the competency levels and profiles of persons with the same level of educational attainment.[5] This consideration is particularly relevant in designing materials for populations that may include both immigrants and native-born learners – since U.S. schooling tends to stress some kinds of skills development (e.g. reading charts and highly formatted text) more than schools in other countries.[6]

This indicates a fairly weak relationship between both "official" education and contemporary classroom assessments of "literacy level" as a valid indicator of actual ability to deal with written materials or to respond successfully to a range of other functional life skills demands in the information society.[7]

Discussions with students in programs designed to serve "non-literate limited-English" learners (together with classroom observations) indicate that such learner populations mix together persons with very different levels of schooling and actual literacy skills. This may actually be fortunate since it makes it natural for more accomplished students to help others – an activity that helps not only those learning from peers but, also, the peer tutors or coaches.

Cyberstep will provide descriptions of learners that acknowledge and make use of learners' personal resources and abilities while, at the same time, frankly confronting the real-world threats and challenges target learners face as a result of their limited education, financial instability, or limited English-language ability.

Life situation, more than demographics or pure literacy competencies, define adult learning needs, style, and an adult learner's overall "profile."

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5 Kirsch et al., "Adult Literacy in America," ETS, 1993. In their discussion of interpretation of results, the authors stress (p. 13) variability within groups.

6 For example, an analysis of the Mexican Instituto Nacional de Educacion Para Adultos curriculum material in relation to U.S. adult education competencies (Kissam, 1992) showed much less emphasis on quantitative and document literacy and more emphasis on prose literacy than in the U.S.

7 Field notes – Anna Garcia, Ed Kissam, Jo Ann Intili – Los Angeles, Fresno, Richmond site visits of the "What Works in ESL Study," 1997.

Workers at the corner auto body shop often learn from their co-workers how to read the manuals for the tools they use; young adults who have decided "to get their act together" may eagerly engage in a program of self-directed learning, while an older, less self-confident homemaker wanting to learn English may seek structured guidance and support from peers. Understanding what these differences mean for effective learning is more important for designing Cyberstep products that are responsive and user-friendly than are traditional measures of literacy level or English-language ability that focus primarily on "placing" a learner in a group of learners at a similar "level" of knowledge.

Profiling Students

In order to accomplish this, Cyberstep's framework for describing learners, their inventory of skills, and the expected outcomes from working with Cyberstep products will profile students in several distinct dimensions, which will include at least:

- A subjective description of who the learner is based on self-assessment – what they are like and what they believe they want to achieve in developing their literacy and communications skills. This might include various kinds of English for special purposes – e.g. to move into a supervisory job or to communicate better with one's children. It might also include specific literacy objectives – e.g. to be able to read manuals for work, to be able to read the newspaper, to write a letter complaining about an adverse decision about program eligibility. This will be useful as a basis for creating greater responsiveness in materials and guiding a learner along pathways that make sense for them or that seem to "feel right."
- A description of the learner's relative strengths in different skills clusters using a skills matrix that relates both to the SCANS and the EFF frameworks for identifying skills areas. The learners' level of functioning will be measured both in terms of self-assessed functional competency (how well they can cope with the immediate challenges they face in their lives) and in a portfolio of demonstrated competencies (things they have done). This will be useful as feedback for learners to know how much more they may need to work in one area or another, to assess how likely they are to succeed in achieving a defined objective, or to decide whether to build further on strong foundations in one area or to move over to remedy weaknesses in an area where they still have difficulty.
- A description of what a learner can do with broadly-defined skills clusters to function in different social contexts or domains (e.g. problem-solving in sorting out the key ideas in a text with distractors such as an advertisement) in writing a letter to a child's teacher, in

preparing an outline and workplan for a construction crew. This has particular potential for assisting self-directed learners and for building self-confidence by indicating how some existing areas of experience and competency can be extended into new and potentially frightening domains (e.g. as in commonplace career counseling with homemakers re-entering the labor force who need to understand how their child-rearing experience can be translated into the workplace).

Use of such a descriptive framework is useful in designing curriculum materials that offer learners various alternative pathways for exploration and learning experience. Design of print materials (which are basically linear) can make do with one-dimensional measures of where a learner is at since the only feasible decision is to provide the learner with one ready-made package of materials. In contrast, CD-ROM-based and Web-based learning systems allow greater recognition of individual learners as multi-dimensional and groups of learners as highly diverse. Thus, Cyberstep's framework for designing materials to respond to the needs of different sorts of ESL learners will describe students in terms such as length of exposure to English, prior experience in school, types of learning goals, opportunities for practicing English, self-confidence in different skills areas, as well as traditional language skills categories of listening, speaking, reading and writing.

The framework for describing who learners are, the clusters of skills they have and the domains and areas where they need to function or function better will also provide useful guidance to designers by serving as a checklist for elements to include in Cyberstep products.

Common Learner Profiles

There are many ways to categorize learners in terms of their situations, interests, desires, challenges and capabilities. The following are only a few examples that illustrate a wide variety of ways to look at the target learner population. In practice, Cyberstep will identify learner interests and refine learner profiles through focus groups and learner feedback. This effort will provide product designers useful guidance in generating ideas about product content that meet significant sub-group needs and desires. This is important because in self-directed learning systems, satisfied and enthusiastic "customers" will spend more time and effort in developing their skills than ones who are simply going through the paces.

This approach will build on "audience segmentation" research like the VALS (Values and American Life) taxonomy developed by SRI, and a variety of similar taxonomies used in market research where variables used to profile and describe learners are tied directly to their life activities, problems, areas of curiosity, priorities, personal disposition, living situation, worries, hopes, aspirations, system demands, etc. This

framework will distinguish, for example, between the needs of "jackrabbit" learners who want to move rapidly but perhaps carelessly through a series of learning tasks and "nervous" learners who want reassurance and frequent feedback. Examples of common learner profiles:

- **At risk workers** with limited time, such as the working poor who can't take the time to go sit in a seat but who want "to get ahead," also mothers with young children.
- **Negative school experience learners** who hated school for one of a host of reasons; they may or may not be unemployed.
- **Remedial education learners** who are enrolled in JTPA training or community college, but who have very serious literacy or English deficits.
- **Long-term, low-skill immigrants** who have been exposed to English a lot but have less than 8 years of schooling and want to learn English to get a better job, help their children or participate in community life.
- **Recent well-educated immigrants** who speak no English and know almost nothing about U.S. culture and legal system but who do have good foundation learning skills.
- **Casual exploratory learners** – both LEP and US-born learners – who are not very motivated but who become involved in using the materials by some program or another.
- **Young immigrants, desiring accelerated learning** but are held back by their lack of English. They are bright and eager to learn in order to get better jobs or go to college.

Incorporating Standard Descriptions for ESL Learners

In addition to identifying new ways to look at target learners, Cyberstep will also use standard categories when needed to clarify the appropriate use of products in traditional educational settings. Identifying commonly understood competency levels for ESL products is critical if the products are to be of use in most schools. The products must speak to clearly understood ESL levels as defined in state frameworks if they are to have wide acceptance in the classroom.

The ESL materials to be developed by the Los Angeles Unified School District are an example. These materials will target learners at the high beginning level.[8] [9]

Specific language skill proficiencies will be embedded in the materials that will focus on issues of significant interest to immigrants. The contextual learning content will be adapted from the Latino Adult Education Services (LAES) teacher materials. They were prepared and field tested by the California State University Institute (1995–1997) under the direction of Holda Dorsey, Hacienda La Puente Adult Education.[10]

The targeted "high beginning" ESL student for the LAUSD products has very limited ability to read and write English and speaks English only in limited situations related to their immediate needs. They are described as being able to function as follows:

- **Work**: Learners can carry out routine work situations requiring only the most basic oral communication skills related to non-technical levels and tasks.
- **Listening**: Learners can comprehend a range of high-frequency words when used in context.
- **Speaking**: Learners can communicate survival needs using very simple phrases.
- **Reading**: Learners can derive limited meaning from print materials with successive rereading and checking.
- **Writing**: Learners are able to copy isolated words and phrases and generate short sentences using previously learned materials.
- **Comprehension**: Learners can sometimes make their basic needs understood when the context supports interaction and in situations when English speakers are comfortable in communicating with nonnative speakers.

The development challenge is to define multimedia learning materials that integrate contextual learning content that requires higher order thinking, communication and comprehension abilities with the learning

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[8] English as a Second Language Model Standards for Adult Education Programs, California Department of Education, 1992, pp. 11 – 15.

[9] *Model Standards* is a document published by a state education agency or state board of education that generally includes desired subject content or standards for a core academic subject in K-adult education and is written by a team of content experts, state agency personnel, and local educators.

[10] For information go to http://www.otan.dni.us/webfarm/laes/.

scope and content indicated in ESL model standards.[11] This is complicated because the subject content of the instructional modules must be fairly robust in order to be of use and interest to adults, but the high beginning ESL student's English comprehension is quite limited. Preliminary research and analysis suggests that the learner's native language should be used, where possible, to convey aspects of the contextual learning themes. Using subtitles on video and alternative language tracks on CD-ROM and Web products can provide this primary language supplementation.

Building on Learner Desires for Transformation

Cyberstep affirms a Blakeian vision of learners as beautifully complex, powerful, and well intentioned but engaged in a difficult struggle to fulfill their potential and to master a host of external challenges.

This is not an aesthetic judgement; rather a practical insight into powerful adult motivations that can enhance learning. Cyberstep products will reinforce the assumption that learners have the ability, desire and right to be creative, to play, to explore, to transform themselves and the world – but also a need and responsibility to set priorities and invest time and energy in confronting the problems they face.[12]

In order to maintain a "real world" focus, Cyberstep will not put "window dressing" on the everyday, ever-present realities of social and economic life by assuming learners will participate in the ideal democracy or labor in the perfect workplace. It will instead frame the learning process in the challenges and opportunities learners face on a daily basis. Students will be assisted to recognize their strengths (assets) as well as to identify weaknesses (liabilities) that they need to overcome to attain self-sufficiency and enhance their ability to function well in society. Cyberstep will also remind instructors and learning coaches, and affirm to learners themselves that they have the potential to "do whatever they set their mind to."[13]

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[11] Since California has by far the largest ESL adult population, it is critical that Cyberstep products meet its standards. ESL standards from other states will also be reviewed and to the extent possible be incorporated into our products.

[12] Huizinga seeks to replace the 19th century view of humanity as homo faber (essentially, factory workers) with a vision of humanity as homo ludens (essentially playful beings, jogleurs). Traditional adult education descriptions of adult learners and their learning needs unfortunately incorporate this 19th century world view of life as "tasks," "requirements" while learning is viewed as "browsing," either a sort of luxury in one's free time or a moral prescription. From a purely empirical perspective, Huizinga's view better describes the workplace, communal, and family skills needed to thrive.

[13] This is a particular concern in materials developed for immigrant learners. Researchers have consistently identified problems stemming from devaluation of traditional "funds of knowledge" or resources of social capital. Affirmation of the value of cultural and personal social resources is an important element in assisting immigrants to "transfer" prior skills or "translate" previous experience into skills which they can deploy effectively in contemporary America.

Cyberstep sees its target learners as active adults, engaged in efforts on a number of fronts to become increasingly pro-active and control or "navigate" their social and economic environment. Thus, Cyberstep takes particular care to describe its target learners in terms of what they want to do, what their aspirations are, and what they want to achieve through study. Key skills areas emphasized are those needed to take on roles in creating, modifying, communicating, and managing new information (not simply acquiring existing information).

These perspectives stem, on one hand, from the work of writers such as Freire and Vygotsky, but also from the need for adults to take active leadership roles in the workplace (addressed in SCANS). Less measurable, but no less powerful, is the desire of disadvantaged adults to identify and express meaning in their lives.[14] Skills requirements (and the "learner needs" which correspond to them) are constantly evolving. Extending skills developed in one context into new and unfamiliar realms is a continuing challenge for learners. Creating learning materials that explicitly respond to strongly felt learner desires to transform themselves, their families, and communities; and assisting them to see how skills developed in one domain are applicable to another, will foster new skills mastery and will help motivate learners to forge on.

[14] See Richard Sennett, The Corrosion of Character, 1998 for a discussion of the challenges faced by contemporary workers in forging a "meaning" to their life within the context of a highly stressful, fragmented time continuum.

Overcoming Barriers to Learning

Cyberstep products are designed to help learners overcome multiple social, economic and emotional barriers to learning.

Many very low-skilled learners have had negative experiences in traditional schools and have little confidence that they can learn on their own. In addition, low-income students typically must face a wide variety of economic, systemic and situational barriers. Distance learning students may also suffer from a fear or technology and become discouraged because of a lack of support when they run into barriers.

Specific barriers – long work hours, childcare needs, family responsibilities, and English-language constraints – are well understood from field experience in the classroom. Other barriers that relate primarily to learners' meta-knowledge of "how to learn" are less well understood and are harder to identify. This will be a particular concern in designing Cyberstep materials because a central use for these materials is to support self-directed learning outside the classroom.

In order to help students overcome these and other barriers, learning concepts will be reinforced in multiple contexts, each with a slightly different focus. We will provide multiple ways to access and work with the information, focusing on contextualized learning (that fosters acquisition of content knowledge, skills and strategies) by building on what learners know and what interests them. We will assist learners to discover the joy and thrill of learning, and discover the sense of achievement from having done something that was difficult but worthwhile.

The materials will offer multiple opportunities for learners to think about what they hope to achieve. We will help them map trajectories for achieving their goals (with side trips that are fun along the way to help them discover things they might not have thought about). This may include interest inventories, goal setting activities, self-assessment (both broad and linked to particular learning pieces), ongoing self-evaluation, portfolios, and other devices that help learners navigate within and between materials

Learning is not just getting new information. Nor is it doing better on standardized tests, "covering material," or "completing a course." These are by-products or secondary impacts of learning. Cyberstep products will support the development of specific skill competencies, deploying

newly acquired skills, and then expanding and enhancing them. The goal is to assist learners to increase their functionality through participation in the course and then to enhance their ability and enjoyment to learn on their own.

Developing Skills in Self-Direction

Native-born adult education clients are very likely to have attended schools that were under stress as institutions due to low staff morale, funding restrictions, and problems relating to violence. Foreign-born adult education clients who are elementary school dropouts have experience only with pedagogical approaches used with young children. In either case, the adult learners' prior schooling will likely have provided them with little experience of learning as an active interaction between the learner and his or her environment.

For at least Mexican elementary school dropouts and probably most immigrants with less than a secondary school education, learning is likely to be seen as "skill and drill" exercises, which are regularly reviewed and praised or criticized by a teacher who is the source of authority and learning. For these learners, it will be necessary to build some ease and confidence in their ability to guide and monitor their own progress without reliance on an external authority figure. Thus, Cyberstep standards for materials design will emphasize elements intended to build learners' skills in "proactive learning," (e.g. reflecting on their own progress and based on that self-monitoring, setting objectives, and revising previous objectives and the mix of learning activities). Some design features included in Cyberstep products to promote proactive learning will include encouragement for trying out and assessing new techniques or activities to acquire a desired skill.

For native-born and immigrant students alike, there will also be an emphasis on the utility of peer collaboration (a learning technique that is often discouraged in authority-centered classrooms). Peers (family, fellow learners and co-workers) will be presented as resources for learning. The materials will seek to promote various strategies of collaborative learning in the classroom, in the mediated learning environment of a social program, and in the course of self-directed learning.

Understanding the Value of Hypothesis Formation and Testing

Conscious awareness of the process of hypothesis formation and testing is an important element in acquiring even basic information-handling skills. For example, reading strategies oriented toward understanding and interpreting, as opposed to phonic mastery, urge learners to identify what a passage means and then ask questions to check whether their "idea"

holds up. Cyberstep materials will seek to overcome that lack of experience with explicit hypothesis formation exercises and testing.

In modules dealing with analytic thinking, we will stress the utility of imagining the practical consequences of an opinion that is expressed (for example, in a letter written by a student to a local official) in order to make the opinion more acceptable by making it less far-reaching.

Adult learners will be encouraged to be curious about how they themselves learn, to formulate hypotheses about their own learning style, and to test those hypotheses.

Emphasis on active hypothesis testing can support adult learners' involvement in collaborative learning and thereby build general familiarity and facility with teamwork. Essentially, "discussions" of issues revolve around different people putting forward different hypotheses, comparing hypotheses, marshaling evidence to support one point of view or another and actively testing which point of view has more merit.

Such exploration involves risks: laughter at an absurd hypothesis, comments that it is not possible to test a hypothesis the way that is proposed, and standing out from the mainstream. Cyberstep materials will model situations in which learners are rewarded for taking intellectual risks as well as situations where they suffer the consequences of taking risks, and then must deal with those consequences.

Distinguishing Skills Development from Knowledge

"Knowing" and "doing" are two different things that, unfortunately, become tangled together in the less-than-ideal settings in which adult basic learners have the most experience. Particularly for ESL students, the idea that being a good student (i.e. listening attentively, taking notes, participating in classroom exercises) lead to "knowledge of English" diverts attention from the necessity to practice speaking English in natural settings.

Probably the most difficult neurological leap for language learners is from the stimulus-response conditioning of language practice in a structured skill-and-drill setting to actually speaking in a natural setting, e.g. listening to what someone says, responding, and then listening to the ensuing response.[15]

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[15] This is another instance of the "langue" vs. "parole" distinction. Clearly a first step in language acquisition is to internalize the "system" of a new language but even when this task is performed successfully, there are operational problems in dealing with the complexities of the real world. A commonly used example is that multiple nesting in clauses gives even native speakers of English difficulty although they have no uncertainties about the underlying recursive transformations which make it possible to construct complex grammatical clauses.

Cyberstep materials will consistently stress the need to extend learning beyond the classroom by actively practicing and extending newly introduced skills. For example, on-line ESL materials on question formation in English might encourage students to do exercises that are progressively more challenging, asking first family members, then neighbors, and finally relative strangers such as shopkeepers, "What did you like best about our town when you got here?" Guidance to students will include encouragement to practice deploying new, fragile skills in friendly settings first, and then in increasingly more challenging, demanding, and even hostile environments.

This is crucial for successful second-language development, but equally relevant is the need to "practice" skills in acquiring information, organizing it, interpreting it, manipulating it, managing it, and communicating it.[16] Students who have gone through a structured set of exercises extending the domains in which they practiced questioning might then be introduced to the idea of poems comprised of lists of images, opinions, or quotes, and asked to "publish" their own poem summarizing what they found out in a common student forum. This sort of exercise might then segue into a follow-on exercise in analytic thinking in which students are guided to review poems posted in this forum after a week and write a short piece about commonalities and differences of other immigrants' first impressions of America.

Here again, collaborative learning options will be threaded into the Cyberstep materials to provide guidance about how to gingerly extend skills further and further, nurturing learners' self-confidence and encouraging the investments of time and energy needed to move toward mastering a new skill or set of skills. This might be accomplished, for example, by encouraging reflections and comments on other students' experiences and sharing ideas about "what works best" for one individual or another. Guidance in extending skills might, in CD-ROM based or Web-based products, include a hierarchy of pathways for practicing skills (e.g. "Now that you've written an email to a friend, here are some sites you might want to explore, where you can write to ask for information on a topic you might be interested in.").

Curiosity and Intellectual Exploration

A common barrier for adult learners is to confuse "covering the material" or "completing the course" with acquiring a set of skills. In pursuing self-directed learning, a common problem is to "go through" the materials without mastery. In practice, of course, there is a delicate

[16] For example, one of the criteria used in assessing the TALS/NALS level of a specific text is the presence or absence of distractors, the need to compare information from one textual location to information from another (which may not be entirely consistent).

balance in the level of programming built into instructional materials. Learners must be allowed some freedom to "move on" beyond a section of material they may not have mastered; on the other hand, they must be constantly oriented toward mastery. Cyberstep standards will not propose specific solutions to the problem but will examine each curriculum feature in relation to "balance" between freedom and guidance.

Learners do not always know how well they are doing. Left to general impressions, they may assess their skills as "good" when in fact they are quite marginal. It is important to guide self-assessment by providing specific examples and resources. One approach is to build in self-assessment utilities, which dialogue with learners about ways that they can assess their own progress or lack of progress. Example: A dialogue box might open a letter the student had previously written with a message, "This is a letter you wrote two weeks ago. From what you've learned since then, is there anything you think you could do to make the letter better?" A list of criteria for checking whether a letter is "good" or not could be available as a reference.

Fostering and Reflecting Self-Identity

While it is routine practice for adult education instructors to engage in a variety of activities to build learners' self-esteem, it is less common that there are active efforts to engage learners in formulating new propositions about who they are.[17] Cyberstep materials will routinely include "mirroring" elements designed to engage learners in self-reflection and to remind them that they constantly confront choices as to how to manage resources as they seek to build their skills.

Particularly in the context of the branching designs possible in the CD-ROM and Web-based versions of Cyberstep materials, it will be possible to overcome the barrier of compromised self-identity by engaging learners in explicitly reflecting on the consequences of choosing one pathway or another. For example, part of the "look and feel" of the user interface might routinely distinguish pathways as being more exploratory or less (e.g. options that state, "Try a new way of doing this." or "Keep on with more of what I'm doing.").

Another distinction between more or less challenging exercises might be, "Want to try the mountain path?" or "Want an easy walk along the river?" Self-assessment utilities might routinely display "scores" as Venn diagrams in which ranges of scores for the "easy" and "mountain"

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[17] In some regards, use of ready-made vocational interest or aptitude tests are problematic. On the one hand, they introduce the learner to new ways of describing themselves. On the other hand, these new formulation are not self-initiated and run the risk of continuing an adult learner's stereotyping as a person of "type X" or "type Y".

pathways overlap. Alternatively, feedback might be of the following form:

"You have been working in the most challenging of four 'learning areas' for this lesson. You did fairly well; you answered four of seven questions correctly, but you were incorrect on three of your answers. You might want to go back and work some more in this skills area before going on to a new, even more challenging topic."

"Over the last several weeks you've usually chosen not to review your work or master the skills you're working on. Maybe you should consider whether you should try to work harder on polishing things off. Or maybe you're really an explorer at heart. The choice is yours."

In this area, as in other areas of product design, Cyberstep will seek to develop a "look and feel" which is not simply a vehicle for content but, at the same time, a means to engage the learner in new experiences, reflections, and dialogues, which in and of themselves build skills. Learners' efforts to find out and describe how they best manage learning and best express who they are will be encouraged as an activity which can provide immediate and practical payback in the form of easier learning and communication in their next step forward.

Principles of Adult Learning

That adults learn best in the context of strongly felt needs and their own life experiences is a fundamental precept for adult education today and the Cyberstep project.

The value of "learning in context" has become a nearly universally accepted concept. John Dewey first proposed it and advocated for a curriculum tied to the individual's interests and experiences. This translates easily into today's conventional wisdom regarding adult learning theory and practice, which suggests that:

- Adults learn throughout their lives with transitional periods often being the cause and motivation for learning.
- Adults do not use skills in isolation, but rather integrated into each other and embedded in a context.
- Adults have diverse learning styles (methods to encode and process information, cognition, and mental models) and learn in different ways, at different times and for different purposes.
- Adult experiences are a rich resource for learning and teaching others. Adults learn more effectively through experiential techniques such as discussion or problem solving.
- In general, adults prefer learning to be problem-centered or solution-oriented and related to their perceived needs.
- Adults want learning outcomes to have immediate application.
- Adults rely heavily on self-directed learning, building on prior experience in terms of what strategies have worked and what have not.
- Adults regularly seek to assess how they are doing and secure feedback from trusted persons on how to do better.
- How effectively adults learn is partially linked to their self–concept as learners.
- Literacy and numeracy skills are more readily acquired when they have regular application to the adult learner's life. This synthesis of life, work and learning skills offers meaning to the adult learner.

- Learning is value laden and should address those issues and experiences that shape and impact the adult learner.

Constructivist Learning Theory

"Intelligence organizes the world by organizing itself." Piaget

Constructivism asserts that learners' actively construct knowledge in the process of making sense of their world. This learning theory postulates that individuals construct their unique understanding of the world by experiencing, evaluating and incorporating their interpretations into their personal worldview. Constructivist learning is active rather than passive; learner-centered rather than teacher-directed. Learning becomes the development of meaning and understanding. One theorist, Glaserfeld, calls it a..."theory of knowledge with roots in philosophy, psychology, and cybernetics."[18]

Constructivists view learning as the result of mental construction. Educational practices would facilitate learning by nurturing learners' active cognitive abilities to construct their own conceptualizations and solutions to problems. It is expected that learner autonomy and initiative are accepted and encouraged.[19]

In constructivist thinking, learning is also affected by the context, beliefs and attitudes of learners who are encouraged to invent their own solutions and try out ideas and hypotheses, building on prior knowledge.

Learners assimilate new information to simple, pre-existing notions, and modify their understanding in light of new data. In the process, their ideas gain in complexity and power, and, with appropriate support, learners develop critical insight into how they think and what they know about the world as their understanding increases in depth and detail. Constructivist educational applications lie in creating curricula that match (but also challenge) learners' understandings, fostering further growth and development of the mind. Constructivist concepts compared to behaviorist concepts reveals differences in basic assumptions about knowledge, learners, and learning. For example, Osberg defines these constructivist features as representing a fundamental shift towards student-centered learning, incorporating our human aspects and abilities: intellectual, emotional, social and creative.[20]

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[18] E. von Glaserfeld, "Constructivism in education, International Encyclopedia of Education [Suppl.], (pp. 162–163), Oxford, England, Pergamon press.

[19] The University of Colorado has a web site that offers a good overview on Constructivism in theory and practice. See http://www.cudenver.edu/~mryder/itc_data/constructivism.html.

[20] *Constructivism in practice: the case for meaning-making in the virtual world*, Kimberley M. Osberg, Doctor of Education dissertation, University of Washington, 1997.

Implications for Cyberstep

Applied constructivist thinking fits nicely with the work of adult education researchers and theoreticians like Knowles, Brookfield, and Candy. It supports the self–directedness that is explicit in adult voluntary learning. The uses of interactive instructional technology to help frame relative learning contexts are consistent with the principal that the learner is in control of the learning.

It supports the concept of providing learning materials that stimulate visual and auditory perception to provide a rich environment where learners interactively imbed and extend their understandings. In creating and experiencing these virtual learning worlds, students can attribute meaning to objects, relationships and behaviors in a way that mirrors their personal understandings, but that is not necessarily constrained by real world attributes that might limit students' perspective.

Profiling Learning Styles

Personal learning "includes the values, goals, and assumptions" one brings to the learning setting.[21] Learning style identifies a person's characteristic ways of processing information, feeling, and behaving in learning situations.[22] There are various approaches to learning style profiling.

A standard set of learning style reference competencies will be developed and strategies and methods that promote these competencies will be woven into Cyberstep products. We will articulate and cross-reference these competencies and their elements with specific parts of the instructional design. The following is an example of a generic set of competencies:

Cognitive Skills

- Organizing and relating new information
- Retaining and recalling information
- Information transfer
- Reflecting, assessing and applying information
- Thinking convergently and divergently
- Understanding the nature of knowledge

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[21] *The Promise of Learning to Learn,* Robert M. Smith, in Learning to Learn Across the Life Span, Jossey – Bass, San Francisco, 1990, p. 17.

[22] *Ibid,* p. 18.

Personal Skills

- Self understanding
- Confidence
- Persistence
- Openness and flexibility
- Sense of purpose

Interpersonal Skills

- Giving and receiving feedback
- Contextual analysis
- Collaborative inquiry and decision making
- Listening and interpreting
- Using human resources

Workforce Skills

Changes in the nature of work and the needs of the workforce drive changes in adult basic education design and content. The most obvious change has been including computer literacy as a part of the definition of functional literacy. Major changes in the workplace are reflected in these changes in workforce skill requirements.[23]

- Good communication skills (reading, writing, speaking, listening)
- Ability to learn independently
- Social skills (ethics, positive attitudes, responsibility)
- Teamwork
- Ability to adapt to changing circumstances
- Thinking skills (problem–solving, critical/logical/numerical)
- Knowledge navigation (where to get and how to process information)

These skills are not exclusive to employment and consequently should be integral to all forms of adult basic education and the intermediate levels and higher for ESL instruction.

Critical Thinking Skills

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[23] Workforce skills quoted from the Conference Board of Canada. *Employability Skills Profile*, 1991, cited in Technology, Open Learning and Distance Education, A.W. Bates, Routledge Studies in Distance Education, 1995, p. 232

Thinking critically – reflecting on the assumptions underlying our ideas and actions as well as those of others, and contemplating alternative ways of thinking and living – is one of the important ways in which we become adults.[24]

Building critical thinking skills with adult basic learners is a difficult challenge. There are significant differences between the factual and basic understandings of language, reading, writing, speaking and listening and the abstractions surrounding how one learns. Flexible thinking is perplexing when applying fixed learning and communication behaviors. For example, changing the color of a routine work form or several fields on the form can completely confuse an adult basic learner.

However, ways of situational thinking and analyzing can be modeled and made real in very practical learning situations. Brookfield suggests that learners can be asked key questions in critical thinking activities.[25] These questions can address underlying personal and social issues. For example:

- How does one develop motivation in formal and informal learning?
- How are extrinsic motives (social contact, job advancement) and intrinsic motives (stimulated or tantalized by learning) interrelated?
- How can one systematically integrate new and different ways of looking at situations into day to day activities?
- What general approaches does one use to explore new knowledge and learning? (Trial and error? Problem solving? Careful planning of short, intermediate and long term goals?)
- In what ways does one feel comfortable in entering new and possibly threatening learning or intellectual terrain?
- How is one doing and in what ways can one improve?

Understanding one's learning style(s) is important. Methods to integrate this understanding with course content will be built into Cyberstep materials along with critical thinking exercises. In order for learners to think critically they must be placed in learning situations where critical thinking is required.[26]

Modeling critical thinking in our content development is a good way to help build these skills. This requires Cyberstep developers to:

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[24] Developing Critical Thinkers, Stephen D. Brookfield, Jossey–Bass, San Francisco, 1987, p.x. Most of this subsection is drawn from this thoughtful book.

[25] Ibid., p. 83.

[26] Reconciling the Literacies of Generations, William Damon, Literacy in America, Daedalus, Spring 1990, p. 50.

- Make the learning examples and contexts clear and concise.
- Provide variety and multiple approaches to presenting information and knowledge.
- Consistently explain factual and contextual information, though not necessarily using the same approach each time.
- Create a dialogue with the learner to reinforce factual and contextual information. Include Socratic kinds of questioning – "why did you…" or "how did you…."

The Cyberstep ESL curricula will include a "learning to learn" module as part of the learning materials. Similar tools will be explored for the other products.

Learning Frameworks

Several different taxonomic frameworks provide useful guidance for describing adult learner skills.

SCANS

Perhaps the most all-encompassing framework for describing adult learners' skills and thereby their "learning needs," is the SCANS framework.[27] The SCANS framework has been presented in several different documents; here we reference the five competency areas (resources, interpersonal, information, systems, technology), twenty associated sub-competency areas, three foundation skills areas (basic skills, thinking skills, personal qualities), and sixteen associated sub-skills described in "What Work Requires of Schools: A SCANS Report for America 2000."

The SCANS framework has the great advantage of having a "functional" emphasis – focusing on the skills "needed" for functioning in a "high-performance" stressful environment. This makes it extremely useful as an over-arching generic framework for systematically describing what adults are called upon to do in contemporary society. While there has been much debate in adult education as to whether the SCANS framework refers only to "workplace competencies," Arnold Packer, the primary force in developing the framework, notes that these same skills are needed for functioning as an effective citizen in addressing community issues.[28]

The SCANS framework can be understood as a taxonomy for effective adult functioning in each of the major information/action domains of contemporary life – family life, workplace, community life, and lifelong learning.[29] SCANS is particularly appropriate for development of Cyberstep curriculum materials because the SCANS competency areas provide a practical but powerful "checklist" for developing materials which stimulate and sustain contextual learning.

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[27] SCANS documents – 1991, 1992, etc. etc.

[28] Arnold Packer, Phi Beta Kappan, XXX. Intili, Kissam, and Wrigley have recently utilized the SCANS framework to track the development of communication, problem-solving, and teamwork skills among a sample of AmeriCorps members in conjunction with their experience in community service.

[29] Kissam, "Reinventing Citizenship Instruction," Mig. Inst., 1993; Kissam, Intili, Dawson, CA Workplace Learning State Plan, 1994; Kissam and Intili, "From Compadrazgo to Total Quality Management," 1994; Kissam and Intili, CA Strategic Plan, 1995; Kissam and Reder, "Responding to Diversity," 1996; Kissam, Dorsey, and Intili, Tierra de Oportunidad, 1997

What the SCANS framework can do extremely well is serve as a systematic and standardized "framework" or curriculum developer "dialect" for talking about the tasks adults are called on to carry out in contemporary society. However, it is extremely important to recognize at the same time that the SCANS framework is not a measurement instrument and the instruments that purport to quantitatively "measure" an individual's SCANS "competencies" or level of functioning are invariably reductionistic and fraught with difficulties.

In the context of multimedia product design, SCANS provides a useful checklist of the full set of skills that are required to deal with real-world situations. This checklist can serve as a way to prompt product designers to remember to include situations that focus learners' attention on balanced development in important skills clusters. For example, by referencing SCANS, product designers will be reminded that the "understanding systems" skills bundle includes skills related to proactively designing or improving systems (e.g. to make sure children do homework, to turn out the vote on an important local issue, or to help supervisors better understand workers' problems).

Because the SCANS framework groups clusters of skills, reliance on it or a similar framework can provide assistance in structuring the sequence of learning activities. For example, within SCANS, "using resources" is a broad category, which refers to many different kinds of resources – time, money, materials, space, people. Reference to SCANS by product designers can lead to materials designed to help learners understand how their newly-developed skills in, say, systematically organizing their writing (e.g. by outlining) can then be extended to systematically organizing how they rely on family, friends, and co-workers as resources.

One important reason for not treating SCANS as a framework for quantitatively measuring "skills gains" but, rather as a framework for describing learners' needs, and curriculum materials' responsiveness to those needs, is that the five SCANS "competency areas" are not unambiguously distinct skills areas. Actually, the five SCANS areas reference clusters of functional activities that are intertwined and, thus, serve as a basis for imputing an underlying "skill" or "ability."[30]

Most learners will have subtle self-assessed differences in terms of their "profiles" across the 16 foundation skill sub-areas and 20 competency areas identified in SCANS and that, by the same token, each will be

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[30] There is widespread misunderstanding of the difficulties of identifying and defining "competencies" inasmuch as all that can be observed is how well individuals perform different activities in a specific functional context or a range of functional contexts. Thus, even valid psychological tests or "assessment instruments" cannot be interpreted to do anything more than to compare the tested individual to a well-described population.

seeking to "grow" or build skills in some priority areas.[31] One of the great strengths of the SCANS framework is that it is inevitably linked to individual goals and priorities. It also recognizes that skills development is open-ended.

SCANS competencies will be incorporated into Cyberstep products and developers will describe these competencies in terms of what things a learner is likely to be able to do already, what new things they may be called on to do in their life, and what things they might like to be able to do resulting from the course. Actual skills development activities considered for incorporation into curriculum materials will be reviewed in "thought experiments" and in formative research to determine whether the material being tested is adequately linked to learners' experience, interests, and goals to merit inclusion. For example, a segment on methods for piece-rate workers to keep records sufficient to tell if they are being cheated by their employers may or may not be of interest to a wide range of adult basic education learners. Striking the best balance between targeted "authentic" segments that reflect the concerns of one group of learners and more general concerns is difficult. Reference to SCANS in organizing learners' reports of reactions provides a systematic way for examining alternative ways to improve materials.

Equipped for the Future

The National Institute for Literacy has developed a skills framework of "standards" for adult performance that is quite similar to the SCANS framework and that shares many of its strengths and limitations. A difference in emphasis is that EFF gives a good deal of attention to "roles" (as worker, parent, and citizen) in which people must function in different social contexts or "domains."

These standards are based on the "Equipped for the Future" (EFF) study (NIL, 1995) that explored adult learners enrolled in programs to provide their views about what they want to know. Cyberstep's target learners are similar to the population interviewed in the NIL survey and, thus, the Cyberstep standards will emphasize that curriculum developers refer to this framework of perspectives (e.g. "customer" statements on "What Literacy Means to Me"). The EFF standards should be particularly useful in highlighting active skills, generating and disseminating information as well as acquiring and interpreting it. This emphasis on "voice" has important implications both for development of ABE materials and for ESL materials.

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[31] Jo Ann Intili's analysis of linkages between self-reported abilities in different SCANS sub-areas for AmeriCorps participants and control group samples suggest significant but not perfect correlation between abilities in different areas.

The EFF standards are structured like the SCANS framework in identifying four major competency areas (communication, interpersonal, lifelong learning, and decision-making) and seventeen sub-areas. However, one methodological limitation of the NIL study is that the sample consists only of a sub-population of adult learners who have successfully become involved in some sort of program (e.g. adult education, drug treatment, homeless shelter).

Cyberstep is intended to be used not only in formal instructional programs but also in a variety of other "mediated" learning contexts as well as a tool for self-directed learning. Therefore we will offset the bias in the NIL sample by giving particular attention to representing clusters of skills that also reflect the interests, needs, and learning priorities of groups likely not to have been included in the EFF study (e.g. low-wage full-time workers).

Ironically, while K-12 education reform has been strongly driven by attention to real-world functional skill demands, there has not been a corresponding effort in adult education. This neglect stems in part from the belief that there was neither time nor resources to provide typical adult education clients the "luxury" of anything more than "basic" skills. More recently attention has shifted from a preoccupation with illiteracy vs. literacy to concerns about the rate at which ordinary Americans are being asked to engage in a broader range of information-related tasks as well as more demanding standards, i.e. for "high performance" skills.

Very interesting work is being done by Lauren Resnick at the University of Pittsburgh in adapting the SCANS framework to the K-12 instructional system. Cyberstep will monitor these developments and incorporate them into its curriculum design efforts in recognition of the need to assure that adult education orients itself toward "excellence," not simply toward "making do."

Cyberstep will, in addition to drawing on the SCANS and EFF standards, consider learner characteristics in terms of several high-quality K-12 curriculum frameworks including the following:

National Science Education Standards

Scientific reasoning is an integral skill in a technology-based society. Cyberstep will draw on the National Science Education Standards to characterize and describe adult learner competencies and, specifically, sub-competencies to address within the SCANS framework. The NSES standards will be useful in "zooming in" on analytic skills, but this framework may also be useful in other areas for describing learners' past experiences and proposing exciting new learning experiences.

We will incorporate activities that involve learners in working collaboratively as part of a team to test old hypotheses and formulate new ones as part of building skills in both active and passive aspects of communication. The concept of exploring, preparing to test, actually testing, drawing conclusions, and reporting those conclusions is a powerful one. Cyberstep learners will regularly be engaged in this sort of inquiry-based learning – testing and refining newly-learned grammatical constructions as part of ESL, checking on reading understanding in on-line discussions, exploring how others react to materials they've written.

The most immediately relevant elements in the NES Standards are the framework overlays designated as "Unifying Concepts and Processes" and "Science As Inquiry," which characterize generic competencies (as distinct from specific content standards for physical science, life science, etc.).

National Council of Teachers of Mathematics Standards

Numeracy is a key component of 21st century "literacy" but is rarely considered as part of the current adult basic education skills set. A critical element in acquiring, interpreting, and managing information in contemporary society is to have the basic mathematical reasoning skills (in addition to arithmetic skills) required to function in key sub-areas of SCANS or EFF competencies.

The NCTM Standards 2000 (currently in electronic draft form, dated October, 1998) are developed explicitly for the K-12 classroom so specific competencies identified in this standard framework are not necessarily relevant to the immediate task of developing adult basic skills in mathematical reasoning. However, several of the general areas identified can usefully be incorporated into the Cyberstep instructional designers' checklist (e.g. comparing data representations to determine which aspects of the data they highlight or obscure; using graphs to analyze data and to present information to an audience, estimation).[32] Standards of particular relevance include: Standard 5 (Data Analysis, Statistics, and Probability), Standard 6 (Problem-solving), Standard 7 (Reasoning and Proof), Standard 8 (Communication), Standard 9 (Connections), Standard 10 (Representation).

The NCTM standards also address the issue of the sorts of information technology tools (e.g. pocket calculator, graphing software) that may be appropriate to provide learners access to in building their quantitative

[32] These examples are considered to fall within the Grades 3-5 curriculum.

reasoning skills. Building such utilities into Cyberstep would be a useful way to orient adult learners to these resources.[33]

Cyberstep's attention to developing basic mathematical reasoning skills and familiarizing adults to the idea that these skills are important tools for managing their day-to-day life as well as making a living has particular promise. One reason for this is that learners who successfully acquire new skills in this area may be able to reap an immediate economic payback – an important benefit and incentive for a population of learners who are mostly low-income.

TALS/NALS Framework

Neither the SCANS nor the EFF frameworks give much attention to reading skills. However, the National Adult Literacy Survey (NALS) provides a credible framework for characterizing the types of passive information-processing (reading) skills required of adults in the 21st century workplace, family environment, community context, and learning environment.

The NALS is extraordinarily useful because it provides very high-quality information on the reading competencies of different sociologically-defined sub-populations in the United States. The skills framework developed for the NALS is much more closely linked to real-world reading competencies than alternative frameworks. An important distinction drawn in the NALS is between prose, document, and quantitative literacy. However, there has been much technical discussion of co-variance among competencies on these scales.

Cyberstep will characterize adult learners in terms of their ability to perform tasks in each of these reading "domains." It is assumed that the majority of Cyberstep's targeted learners will have average skills levels within the Level 1 range but that, in some sub-areas, they may function within the Level 2 range. Furthermore, it is assumed that a reasonable generic goal would be for all to seek to develop skills to the top of the Level 2 range, e.g. to ultimately bring targeted learners up to the median U.S. reading/information-processing level. Specific justification for this objective stems from the NALS Section 2 discussion of the relationship between literacy levels and social and economic characteristics.

Functional English-Language Ability

Language does not exist in isolation, nor is it learned in isolation. Contemporary researchers stress the importance of understanding the

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[33] Java-driven tables at Web sites, for example, now calculate mortgage payments on different types of loans, a computation even very well educated adults cannot do. Adult content should probably, at a minimum, inform learners that such tools are available and why they might be useful.

many different factors that enter into this process, and the different dimensions of language competence.[34] For the ESL learners Cyberstep is to serve, the key issue is to assess how they are doing and what they might do to learn English better, as distinguished from a single "magic" measure of "how good they are at English."

Since the practical need for describing learners' English-language functioning is to present generally effective English-language learning strategies for the targeted population and help learners to hone these strategies, Cyberstep will give particular attention to the diversity among learners to individual personal style and circumstances in assessing language competence.

The adult learners targeted by Cyberstep are likely to vary greatly in terms of length of exposure to English and schooling (an important determinant of ease and facility in classroom acquisition of a second language).[35] In general, the limited-English (LEP) learners served by Cyberstep will have two very distinct sub-groups in terms of English-language acquisition: older immigrants and refugees with minimal schooling but a relatively long period of exposure to at least some English vs. younger, relatively well-educated immigrants who have arrived only recently. The older learners will, on the one hand, have a good backlog of exposure to English but little confidence. The younger learners will, in general, feel somewhat capable of acquiring a new language but have virtually no exposure to English. Product design will take this into account in all materials but, most obviously, in relation to setting up distinct pathways for learners using CD-ROM and Web-based products.

Because language is inextricably tied to social, economic, and cultural life, product design will take into account the many different language environments experienced by English-language learners. The versatility of CD-ROM and Web-based products makes it possible to customize instruction for learners who live in a variety of social contexts, including: immigrant enclaves where one particular language other than English dominates daily life, multiethnic neighborhoods, and communities where only English is spoken.

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[34] Ellen Bialystok and Kenji Hakuta provide an excellent overview in In Other Words: The Science and Psychology of Second-Language Acquisition, Basic Books, 1994.

[35] Levels of educational attainment have historically been used as an indicator of the "quality" of immigrant flows. For the past decade, we have observed that the educational attainment of new Mexican immigrants to the United States has been increasing (due to a number of social and economic factors in Mexico). While less pronounced, a similar transformation is likely to be underway for all immigrant groups. Thus, for most LEP adults, length of time in the U.S. and educational attainment are inversely correlated.

Contemporary adult education curriculum frameworks and assessment instruments often provide limited taxonomies for describing the English-language abilities of Cyberstep's targeted adult learners. Such classification schemes have some empirical validity for grossly characterizing different levels of English-language ability but little utility for curriculum design or effective product development.

The Saussurian distinction between langue and parole, e.g. between a hypothesized ideal language "system" and speech (the use of language in the world) are relevant here.[36] In practical terms, Cyberstep will seek to overcome this problem by focusing on English-language skills development and anchoring curriculum to social contexts which are likely to be encountered by the targeted learners and where they can routinely practice and build proficiency.

Interestingly, for basic survival, few of the limited-English adult learners served by Cyberstep are likely to need "survival English." But they are very likely to need "English for special purposes," that is, for coping with what may be infrequent but, nonetheless, critical needs to communicate, often under stressful circumstances.[37] These special purposes include, for example: dealing with law enforcement and health care personnel, finding a new job, applying for social services, or communicating with neighbors to cooperate in addressing a common concern or in resolving conflicts.

A 1996 survey of enclaves of limited-English adults in three California communities showed, for example, that most LEP adults functioned well in routine communication in their current day-to-day social environment, but that their lack of English foreclosed the beyond their language community. For example, few needed to know English better to work in their current workplace, but virtually all needed to be more proficient to get a better job, to communicate effectively with school authorities, or to participate in an informed way in the civic life of their community.[38]

Cyberstep will seek to characterize its targeted ESL learners' English-language ability in terms of functional oral English, utilizing the sort of sociolinguistic taxonomy of utterances in context developed by Fishman and Ma in "Bilingualism in the Barrio" and extended by Gomperz and

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[36] Most problematically, even if it were to be believed that a grammar-based curriculum were the best framework for describing language competency, current frameworks use inaccurate and misleading grammars based on surface structure rather than the underlying syntactic structures of generative grammars.

[37] See Anne Fadiman, The Spirit Catches You and You Fall Down: A Hmong Child, Her American Doctors, and the Collision of Two Cultures, The Noonday Press, 1997, for a powerful account of how culture and language interact when special problems arise.

[38] Kissam and Reder, "Responding to Diversity", 1996.

others. A premise of Cyberstep is to assure that ESL curricula are customer-responsive, e.g. provide the language tools learners can use to pursue their goals in key contexts and domains of their daily life.

Careful attention will be given to the communication context (to whom one speaks, how often, about what, for what purposes). In response to the real-world context of LEP adult learners' experience, Cyberstep will give particular attention to the problems faced by adult learners in negotiating the dialect of class and sociological grouping, e.g. in communicating with banking personnel, with law enforcement officials, with workplace supervisors and colleagues.

Exercises designed to build English-language speaking skills will cover different contexts of spoken English ("formal" vs. "informal"). They will also include an emphasis on "speech acts" (sometimes referred to as the pragmatics of language) introducing idioms and strategies for suggesting, persuading, politely indicating doubt, insisting, requesting (as distinguished from demanding or simply asking). In the context of building reading skills, throughout Cyberstep materials, careful attention will be given to the source of information (e.g. from an advertiser, an expert, an advocate, a regulatory agency, a friend).

Language standards, in particular, will assess learners' ability to use language, not simply in isolation but in a relatively broad range of domains. In both ABE and ESL, reading standards will assess learners' versatility or agility in dealing with a real-world range of documents – employment and program application forms, consumer surveys, advertisements, flyers, pamphlets, newspapers, magazines, the results of on-line searches, Web pages of differing design.

Writing standards will examine and assess not simply writing within a conventional genre (e.g. letter, resume) but writing to achieve one or another individual purpose – to seek a refund, to ask for additional information, to express an opinion, to express condolences, to provide suggestions, to encourage a friend or child away from home.

The limited-English proficient adult learners targeted by Cyberstep are, to a substantial degree, imprisoned within a dungeon of English as simple, declarative sentences or questions. Yet, "voice" is necessary to participate significantly in the community and economic marketplace as well as at work. Cyberstep curriculum developers will give high priority to exploring uses of English for what might be called "speech acts," using language to pose questions, express doubt, praise, reflect, persuade, negotiate, console, promise, etc. Use of language as part of social interaction is, of course, a universal of culture.

It is precisely for this reason that exploring the constraints LEP learners face in "translating" their home country language and behavior into a

new English-language context is a priority – because this is an area where mastery can provide powerful positive reinforcement for continuing to use English.

Another goal of targeted learners' English-language acquisition is to develop another dimension of "voice," e.g. the ability to use English as a tool for asserting their individual identity and extending personal relationships beyond those who speak their native language – English for joking, making friends, bragging, seducing, wheeling and dealing, and mediating, among others.

From a product design perspective, this means that it is important to portray a wide range of uses of English language while showing that there are personal and work-related rewards for using English to express one's own identity, (e.g. by overcoming racial stereotypes or by asserting one's individual rights to formulate his/her own perspectives and expressing them).

It also will reinforce the overarching emphasis throughout Cyberstep on the need for ABE and ESL learners to explore new social environments even though many of these may be unfamiliar and frightening. Cyberstep materials might, for example, include a variety of virtual field trips through different social contexts (e.g. going to an art show, looking in on a self-help group's meeting, making a presentation to a school board).

One of the great challenges of our diverse society is to acquire the tools to better understand each other, work with each other, respect and build on each other's strengths as well as our own. Cyberstep products will frame language acquisition in collaborative and mixed social contexts to help develop these cross-cultural and cross-gender understandings.

Curriculum Standards for Social Studies

Preoccupation with the phenomenon of "illiteracy" has, at times, distracted adult education from attention to the full set of "basic skills" required to function effectively in contemporary society. Cyberstep, together with many educators, believes that the ABE and ESL agenda/curriculum must include attention to all-round skills, not simply workplace skills.

The Curriculum Standards for Social Science, despite being developed for the K-12 environment have relevance for Cyberstep design. The area generally referred to as "social studies" in the K-12 context cannot be considered to be an educational "luxury" for ABE and ESL learners. Like all adults, both groups of learners are regularly confronted with challenges in social relations. More than the general public, Cyberstep's customers must navigate areas of the society where class, income, language, and ethnicity result in challenging situations – in charting

one's own course, in getting along with neighbors and co-workers, in pursuing family life in a society where widely-differing sets of values compete for children's allegiance.

The Curriculum Standards for Social Studies identifies ten strands of knowledge, referred to as 'themes" which make up the social studies curriculum. As in the case with the K-12 mathematics standards, some of these have more relevance for adult basic skills development than others. Nonetheless, basic skills in several of these knowledge/skillls areas have particular relevance for the challenges adult learners face. These include: people, places, and environments (Theme III), individual development and identity (Theme IV), individuals, groups, and institutions (Theme V), power, authority, and governance (Theme VI), and civic ideals and practices (Theme X). Cyberstep will consider this framework, along with the others discussed above, in developing content and in overall assessment of adult learners' skills development needs, learning objectives, and growth of information-handling skills.

Distance Learning

Distance learning technologies offer options that can help ensure access to educational resources for all segments of society.

Daily life for most adults has become more complex and demanding over the past few decades. Many adults are unable or unwilling to attend traditional adult education schools and classrooms because of:

- The growth of single parent families who work and need child care.
- Low-income families working split shifts and multiple part-time jobs.
- The dearth of public transportation systems that reach to the areas where learners often live, work and go to classes.
- Public safety issues in many urban and suburban communities.

People, who can't attend traditional classes because of work conflicts, childcare, transportation, and/or safety reasons, need new alternatives. These adults are prime targets for distance learning.

Policy makers and administrators are considering and experimenting with expanding various distance learning modalities to take learning into homes, the community, and the workplace.

Distance Learning Defined

Distance learning traditionally has provided access to instructional programs for students who are separated by time and/or physical location from an instructor. Distance learning is often thought of as prepackaged text, audio, and/or video courses taken by an isolated learner with little or no interaction with an instructor or other students. However, this perspective is changing. Today information technologies allow a rich interactive distance learning experience that can surpass the interactivity of a traditional classroom.

There are several definitions of distance learning or distance education that are popularly used. The Cyberstep developers favor the following definition:

Distance Learning (DL) is an instructional delivery system that connects learners with a network of educational resources. DL can augment traditional classroom education and provide educational access to remote learners who cannot attend traditional classes or who are not enrolled in educational institutions but can benefit from self-directed learning. The implementation of DL is a process that builds on available resources and will evolve to incorporate emerging technologies and increasingly interactive approaches to learning.

There are two basic distance learning delivery system categories – *synchronous* and *asynchronous*. Synchronous instruction requires the simultaneous participation of students and instructors. The advantage of synchronous instruction is that interaction is done in "real time;" students get a feeling of virtual community; and they may receive immediate feedback through interactive TV, teleconferencing, computer conferencing, and Internet relay chats (IRC).

Asynchronous instruction does not require the simultaneous participation of students and instructors. Students do not need to be gathered together in the same location or "tune in" at the same time. Rather, students may choose their own instructional time frames and interact with learning materials according to their schedules. Asynchronous instruction is more flexible than synchronous instruction and may be better customized to fit individual learner needs. Moreover, in the case of telecommunications such as email, asynchronous instruction allows and even may encourage community involvement (e.g. in online "virtual" communities) when it might otherwise not be possible. Forms of asynchronous delivery include email, listservs, audiocassette courses, videotaped courses, correspondence courses, CD-ROMs and WWW–based courses. A disadvantage to consider with email-based interaction is the reliance on written exchange, which can be difficult for low-literacy adults.

Three elements are of paramount importance to any successful distance learning program.

- Instructional design
- Technology
- Support

Support is often undervalued in design and implementation but is essential if students are to be helped to sustain involvement.

The Promise – Interactive Distance Learning

A new paradigm for interactive distance learning is rapidly evolving because of new interactive technologies. A central component of this

new paradigm is machine-based or human-assisted mediated learning. Action learning activities are included to enhance and sustain the learning experiences. It promotes learning experiences based on the following types of interactions:

- Instructors with students.
- Students with other students.
- Students with other experts such as potential employers or community decision makers.
- Students with resources such as hyperlinks, search tools, and other dynamic electronic sources.

Through the use of technology, these interactions can occur at any time or in any place. This new interactive distance learning will change the environment both on and off the adult education site.

These changes will allow educational institutions dramatically increased flexibility in working collaboratively with other concerned organizations and partners (e.g. local businesses, workforce development agencies, volunteers), in developing individualized "mixes" of learning interventions using whatever resources are available locally (e.g. a short, intensive in-class program with follow-up via self-directed study, coaching by a volunteer mentor, and peer interactions via email).

A Limitation – Reimbursement for Distance Learning

Most adult education organizations are reimbursed for instruction based on seat time or "full time equivalency." This funding model, drawn from the classroom, hampers multi-modal and other effective ways to deliver instructional services such as learning centers, off–site and take home instruction, telecourses, video based learning, and emerging Internet learning opportunities.

There are a few reimbursement models that equate machine–based learning with seat time in order to determine a reimbursement rate.[39] However, distance learning will not be widely used by educational institutions until there is agreement at the state levels on how to reimburse the provider for it.

Performance based or value added reimbursement is one way out of the dilemma. An adult education organization can be reimbursed on the

[39] Two examples – a for–credit telecourse in the California community college system is worth one half the reimbursement rate as a class based course while California adult schools establish comparative ratios with classroom instruction for their state approved distance learning programs.

learner's progress, using a specified test.[40] This approach is likely to be very attractive to legislators and some state and federal administrators. However, it poses budget planning problems for the local administrator who can not predict from year to year how much revenue to expect.

Distance Learning Standards

The Western Governor's University has established a set of standards to guide distance learning content development. These standards are based on the Principles of Good Practice developed by the regional accrediting agencies for programs offered by accredited institutions.[41] They provide sound guidance for Cyberstep product development and are reproduced *verbatim*.

With regard to instruction, the education provider ensures:

- the rigor and the quality of instruction;
- the technology used to be appropriate to the nature and objectives of the instruction;
- the currency of materials and instruction;
- the ownership or possession of appropriate copyright clearances for all materials used in instruction;
- where appropriate, timely and adequate interaction between students and instructor, and among students;
- appropriate instructional support and training services for its instructors.

With regard to evaluation and assessment, the education provider:

- makes information available to students which would help them assess their capability to succeed in distance education courses;
- evaluates the educational effectiveness of its distance education instruction, including assessments of student learning outcomes and learner satisfaction;
- ensures the integrity of student work.

With regard to library and learning resources, the education provider ensures:

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[40] The Los Angeles Unified School District Adult Education Division is testing an alternative reimbursement system. The purpose is to reward demonstrated success and not reward participation without success. The value-added model has these features: (1) No reimbursement will be claimed for learners who do not complete a unit of instruction with at least an 80% demonstrated competency using LA's standardized competencies; (2) no competency will be verified more than once; and (3) for learners who successfully complete a unit of instruction and who can demonstrate they have completed "life enhancing competencies," LA Unified will claim an additional 50% reimbursement per unit of instruction.

[41] See the Western Interstate Commission for Higher Education, http://www.wiche.edu/.

- that, when applicable, students have access to and can effectively use appropriate library resources;
- access to laboratories, facilities, and equipment appropriate to the courses.

With regard to student services, the education provider:

- supplies students with clear, complete, and timely information on the requirements, nature of instructor/student interaction, assumptions about technological competence and skills, technical equipment requirements, availability of academic support services, financial aid resources (when applicable), costs and payment policies;
- ensures an adequate means for resolving student complaints;
- clearly and accurately represents its instructional offerings and support services available.

With regard to facilities and finances, the education provider:

- possesses the equipment and technical expertise required for the distance education instruction it offers;
- has in place the long range planning, budgeting, and policy development processes for the facilities, staffing, equipment and other resources essential to the viability and effectiveness of its distance education courses.

Learning Categories

Three learning categories are of particular interest to the Cyberstep developers – formal, self–directed and mediated learning.

Formal Education

We define formal education as learning that occurs with a recognized adult education or training organization. Formal education usually leads to a certificate of completion or recognition of mastery. At the least it incorporates a learning curriculum and the monitoring or assessment of learner progress. One of the values of "formal education" is that the provider is recognized as a learning organization and consequently the learner, teacher, product developer, potential employers and other educational institutions recognize the certification as having value.

Self-Directed Learning

Self–directed learning as used in our framework is learning that occurs for the purpose of personal mastery, understanding or interest. It usually does not result in a certificate or recognition of mastery. However, it can be offered by a learning organization, though usually at a minimal cost or free of charge.

Mediated Learning

Mediated learning is learning that occurs in an interactive context where there is feedback on learner progress and mastery. This feedback can come from a human instructor or coach (intermediary) or from logic programmed into courseware. In either case the learning is expected to follow an outline or structure deemed to optimize or facilitate learning. Mediated learning usually occurs within the context of formal learning because the education provider seeks to be reimbursed for providing its learning resources.

Mediated learning on the Internet usually is organized as a formal class with persons enrolling and participating in an organized sequence of study over a fixed period of time. However, much of the interaction occurs via electronic means including email, electronic assignment and report transfer, online chats, and teleconferencing. The instruction mixes *synchronous* and *asynchronous* learning, relying primarily on the asynchronous.

Implications

Each of the Cyberstep multimedia products can be used in formal, self–directed and mediated learning. Design parameters will support this from the beginning. For example the ESL videos will be designed to be used in multiple environments including broadcast and cable television delivery. The print materials can be used by a self-directed learner to assist his or her own development, in conjunction with a formal distance learning course that includes two way interaction with an instructor, or as part of a traditional in-school class. Likewise the CD-ROM, Internet and WebTV delivered learning materials will be used to support formal instruction or self-directed learning. The design and delivery will anticipate multiple uses and types of learning environments.

Active Learning

When learning is active, students do most of the work. To learn something well requires the ability to hear it, see it, ask questions about it, practice it, and discuss it with others. In addition, learners must develop the ability to figure things out on their own, try out new skills and accomplish tasks that depend on the knowledge the learner has acquired or already possesses.

The Cyberstep materials will be designed to support active learning. Suggested exercises will be part of the print and supplemental materials. Strategies to incorporate the machine based learning into cooperative learning will be defined.

Enhanced Learning on All Levels

Cyberstep takes a larger view of self-directed learning than may be implicit in the term. Learning is always self-directed, in a sense. Certainly, if people are interested in the materials and feel they address a need for themselves, they will be more likely to pursue learning. It is not enough to attract a learner once, however; materials must provide a sense of continuity, an ability to progress toward a valued goal. They must sustain interest and provide for different types of reinforcement for success. Learning is both serious and fun; a solitary and a social event. Particularly if it may take a long time to achieve their goals, students must see ongoing progress and concrete benefits. And it is something that is not linear; learners typically reach plateaus requiring changes in strategy or approach.

Cyberstep accepts these principles and its products will structure a variety of pathways for an individual to interact with the materials. Cyberstep will extend the resources available to the individual or group by providing structured activities that involve the learner with others who

are similarly working on learning activities, or that involve the learner with coaches with whom they can try out their newly acquired skills.

The term "self-directed" evokes the image of a motivated individual struggling to master a set of skills by himself or herself. In the cyber-world, this would be an individual sitting down at his or her computer or video set to master not only how to use it, but to get something out of the materials on it.

If one is learning to make a door, this vision works to some extent. One can saw and chisel until the door fits, and thereby see one's progress and success, and imagine what skills might have been useful to make it go better. With literacy and English skills, however, there are sufficient subtleties that a learner would ideally benefit from strategic guidance, not only about the next set of tasks to work on, but about the entire process of learning – how it relates to their previous experience, as well as to their goals and immediate needs. Machine mediation is not terribly helpful in providing this guidance. However, online connection with an instructor, mentor or guide can be of assistance.

Cyberspace will offer several benefits to the instructional process and to the learner. Learners can get help or try out new skills without risking "loss of face"; can work sometimes alone, or with a small group of people of like skills, or with a small group of people with diverse skills without changing location. Learners can also arrange for face-to-face help and use cyber-learning as a supplementary tool.

Cyberstep design and products will facilitate learning through embracing principles that provide structure to learning for the individual, but also involve individuals in setting their own structure by:

- Providing various pathways into use of the materials: Cyberstep materials can be used by an individual, or in context of a class, or in the context of a work-group either organized by the individual or by an agency.
- Providing various gauges for a learner or for an instructor to understand what a module may be useful for: Cyberstep materials will be described in a basic skills+ matrix in terms of where they fit with traditional learning as well as with life skills curricula, and other learning activities.
- Building learning as a social activity: Cyberstep materials will encourage learners to use their own networks to facilitate learning by structuring activities or topics to extend the materials to the learners' friends or family or workmates.
- Providing materials that learners can use to test their own skills: Cyberstep materials will include "skills contests or challenges" to

test one's skills, self-assessments, and access to a "coach," who may even be another student, who can answer questions.

Cyberstep embraces the idea of the conscious learner. Such a learner is conversant with the learning process, what skills are needed to achieve specific goals he/she is interested in, how other learners have accomplished these goals, and the collateral skills involved with this. The conscious learner understands the resources available, what they are useful for in general, how they may be useful specifically for him or her, and how to make effective use of them. The learner is aware of what the person wants to achieve and the level of performance needed to achieve specific goals, and progress. The conscious learner knows to celebrate learning and accomplishments, and how to leverage the most out of their skill gains.

Learning Management

Management of learning is a task shared by the student, teacher, co-learners, facilitators and curriculum developers.

Cyberstep assumes that learning can be guided, but that the learner has to be part of the guidance process. Instructors are agent provocateurs on behalf of learning. Their tools include their knowledge and experience, available networks, and other students in the class. There are no pat approaches that are guaranteed to succeed; rather, learning has to be managed both by the learner and by the learning agent provocateur. However, in practice, both the learner and the instructor tend to leave the management of learning to the other.

The learner often thinks (or acts as if he or she thinks) that the instructor and the class listing define learning; and if they, the learners, aren't accomplishing their goals it's because either they can't learn or there isn't anything to learn. The Instructor often thinks (or acts as if he or she thinks) that the learner knows what he or she wants and if the instructor does a good job with teaching, learning will occur. While these ideas may be commonly held, they lead to low instructional productivity resulting in students who leave or tend to repeat the same class. Cyberstep will help both the learner and the learning facilitator with learning management, and learning productivity.

Traditional levers for learning management are placement, progress tests, feedback and record keeping. Cyberstep materials will aid the learner and the learner's assistant(s) to know what has been done, what was gained in the process, and how it measures up to what's needed to accomplish learner goals. Cyberstep will assist in this by providing:

- Referenced materials – that is, materials aimed at real world issues, and catalogued by skill.
- Simulations of situations in which learners can try out their skills and gain feedback.
- Automated records of their progress with the materials, in understandable form.
- Charts and illustrations of their progress.
- Opportunities through games or contests, to test out their skills and see how they measure up.

- Access to a coach, tutor or mentor (where possible) who is familiar with the materials but also with other resources as well.

Cyberstep can, in some learning contexts, do more than this, as it takes on the role of expanding learning opportunities for the student. We believe this is important. A learner's rate of progress and sense of personal achievement will be bolstered by design features built into Cyberstep to promote learners' ongoing practice and deployment of skills in the course of their daily lives. Encouraging real-world "offline" use of skills introduced in Cyberstep will help learners see the progress they have made and the immediate benefits they gain from skills development. It can also help them to establish a broader vision of lifelong learning. Multitudes of day-to-day activities, which are not normally considered to relate to "education," are in actuality part of lifelong learning and ongoing skills development.

In the classroom context, retention of learners can be seen as a measure of learner success, if learner retention is conceived of as learners who make it through the cycle to achieve their real world goals. In the self-directed learning context, it may be preferable to refer to learner persistence, personal investment, and aspirations. If learners can be encouraged to place a high value on the learning experience and its ability to demonstrably add value to their own lives, learning benefits can be maximized.

Cyberstep materials design will encourage "showing off" newly-developed skills, sharing information with others, using new skills to actually interact with others – through discussing, questioning, and writing. This will, in turn, expand learning opportunities by drawing in significant others into the experience, being relatively low maintenance for learners, teachers and administrators, and making the learning experience a part of the life of the learner, as well as a lifelong enterprise. Cyberstep learning products will assist in this way by providing:

- Opportunities to reinforce their involvement in learning as a fun activity.
- Bridges that extend their current interests to resources for future skill development.
- Bridges that link learning in one area to applications in other areas.
- Concrete images of benefits from pursuing further skill development.
- Activities that build on and reinforce the social nature of learning.
- Access to the patterns, trends and developments in society at large, and in their particular field, and how they can build on current skills to pursue these.

- A source for feedback about what the materials mean to learners and what they've accomplished through them. Generally this feedback will come from collaborative learning forums built into the materials but, in some cases, such as the WebTV products it is possible that Cyberstep materials may provoke collaborative learning among a group of learners (e.g. a family gathered in a living room).

Learning management involves understanding with learners where they are now, where they want to go, and working with them over time to see what they've accomplished, and assisting in determining what they could do next. Research on learner retention is rife with reports that as many as 50% or more students leave adult education programs "for personal reasons;" sometimes these personal reasons may flow from an undercurrent of feeling about the lack of contribution of the class to the person's life.

Cyberstep will structure its activities and instructional content to be attuned to individual student profiles and will provide the underlying technology to create learning teams comprised of a "coach" and other learners at a similar place or beyond on the learning cycle. With these opportunities, Cyberstep products and systems can serve as an augmentation to the learner as well as to the learning agent provocateur (the instructor).

Learning management should be strategic, straight-forward and clear, yet imaginative. Cyberstep will work to structure learning activities that invite learners to open their horizons to different options in a safe environment. By being virtual, Cyberstep has the opportunity to show learners possible results of engaging in different behavior, and provoke discussion as to whether this is real or possible. Invitations to participate in these activities can be strategically triggered by learners' profiles.

Learning management should be part of the learning process and not an awkward, distracting, add-on. Many learners fear testing and anything that smacks of it (like recordkeeping and management). Cyberstep will address this by automating much of the recordkeeping, and designing in a combination of curriculum-based assessments, personal assessment, and short criterion-based assessment as part of the learning materials. These will be framed as "test yourself" and "challenge the expert" pages, or some other arrangement that invites the learner to participate. Results will be stored in a portfolio for the learner, referenced by skill gains and topic.

Technology and Education

Information technology is impacting all aspects of our lives from how we work to how we play and learn, but will it replace the teacher?

Most of the today's media (television, print, radio, video, film, etc.) communicates one-way and linear information. Recipients of information have little if any control over what they see or hear. The information is presented in a predetermined order and rate established by the developers of the media. In its most basic printed form, media has been used to supplement teacher instruction for centuries. Until recently, even the most vivid and compelling media have been used in much the same way as books to substitute for teacher lectures. However, new computer and telecommunications technology can now provide greatly increased opportunities for students to engage in collaborative and experiential learning activities.

Moore's law on Integrated Circuits[42], which states that microprocessor clock speed will double every two years, defines the relentless pace of accelerating computation.[43] While there is not a similar rule of thumb for telecommunications speed, we know that inexpensive bandwidth for Internet data delivery (packet switching) will be widely available to small learning organizations, employers and the self-directed learner in the near future.

The increased bandwidth of the commercial Internet will be available inexpensively to the home via the telephone as well as bundled as a part of cable services.[44] This will fundamentally change how some adult basic education can and will be delivered. We can expect that this delivery will be "just in time" and continuously refined.

More difficult to predict is the manner and extent to which adult educational technology will be integrated into adult learning organizations. Adult educators, as a group, are hindered from embracing

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[42] Gordon Moore is one of the founders of the Intel corporation.

[43] Ray Kurzweil expands on Moore's law to demonstrate that it is a but a paradigmatic step in the century long exponential growth in computing that should continue indefinitely. See **The Age of Spiritual Machines**, Ray Kurzweil. Viking Penguin, 1999, p. 25.

[44] Bandwidth determines how much information (text, images, video, sound) can be sent through a connection. It is usually measured in bits-per-second. A full page of text is about 16,000 bits. A fast modem can move approximately 15,000 bits in one second. Full-motion full-screen video requires about 10,000,000 bits-per- second, depending on compression.

the positive aspects of learning technologies in large part because of budget constraints and sometimes technophobia. The lack of appropriate adult learning materials is also a factor.

Consequently, we cannot necessarily expect that the integration of adult education instructional technologies will be uniform or even wide spread over the next five years. However, performance based accountability requirements in the federal adult literacy legislation (Title II, Workforce Investment Act of 1998) can be expected to change the nature of the adult education multi-provider delivery system in the United States as will the "work first" paradigm in federally supported job training programs. In the new world of educational accountability, the likely losers will be the small volunteer and literacy organizations who will not be able to collect and process learner performance data. Distance learning technology may allow these programs to remain viable.

The decrease or loss of face-to-face interaction with teachers and peers is a central concern in embracing instructional technology. Some professionals view it as a decrease in instructional quality, though research does not bear this out. The conventional wisdom is that the use of instructional technology will be slow to occur outside of providers' sites. Multimedia tools will be used to supplement classroom leaning and then spread to learning centers. However, the unsuspected embracing of access to the World Wide Web as an essential home utility begs the reliability of conventional wisdom. Distance learning may leap frog traditional classrooms and institutions and spawn whole new ways to gain knowledge and skills.

Evolution of the traditional model of learning must be supported by persuasive reasons for change. The potential for increased time on task, and the increased flexibility of instructional technologies and learning contexts are the key reasons. Virtual learning communities can be formed, in which learners and instructors in multiple locations can be part of the same meta class or study group. They can contact one another at any time of the day or night to share observations, information, and experience with one another.

Another consideration is that technology is now beginning to significantly change the shape of information dissemination in the United States. Information dissemination and marketing are increasingly interactive, routinely configuring the style and content of materials to a user-created profile of their interests, immediate information needs, and preferred style of presentation. "Basic" functional literacy has already

come to imply the ability to function in this increasingly fluid information environment.[45]

Successful functioning requires higher levels of proficiency in some "old-fashioned" skills (e.g. assessing the reliability of information from different competing sources), and some "new skills" (e.g. assessing the unique "style" of several different search engines for meeting one's information needs). This presents a powerful argument to include within the communication and "learning to learn" responsibilities of adult education, efforts to provide learners with the ability to navigate to the information they need.[46] Integration of contemporary information technology into the content/curriculum of basic skills instruction is an important step to provide learners expanded opportunities to increase their knowledge and skills in navigating this virtual universe.

Access Issues

Increasing access to learning is very important regardless of how multimedia learning technologies are adopted by learning organizations. The more adaptive organizations will replace those organizations that do not adapt to their learner's barriers and needs.

Supporting multiple uses of and access to Cyberstep products is a central design criterion for Cyberstep products. Many implementation and integration decisions are beyond the project, however, we are confident that the products can be used as the prime or supplemental learning content in traditional site based learning as well as non–traditional locations such as the workplace and home. Developing for the WebTV format will allow Cyberstep products to be accessible to people using low cost and easy to use Internet access deices for their home.

Partnering for Content Development

While the technology for delivering instruction in non-traditional ways continues to improve and expand, quality curricular content has not kept pace. The primary reason for this is the high cost of product development and low potential for return on investment. Few entities have the necessary resources to develop and bring these products on line. This is particularly true of content designed for video, CD-ROM and Internet delivery.

Because quality content is so necessary to sustain the various distance learning modalities, new and creative ways must be found to underwrite

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[45] For example, web-based information dissemination has become an important vehicle for public health campaigns and for government agencies' communications with the public in addition to practical day-to-day transactions such as finding local bus schedules, weather, ordering books, and so on.

[46] The inevitable consequence of exponential increases in accessibility of information is the need to manage information overload – in the workplace, in family life, and as part of informed participation in public life.

the development costs. One obvious solution is the creation of funding and development partnerships or collaboratives where costs and talents are shared. Another critical strategy is to create and deploy powerful tools that will facilitate product development and greatly reduce the time and cost of production.

Serving Technology Pioneers

Distance learning experiences to date suggest that instructional development and technical support efforts should be directed at adult education "pioneers" who are the early adapters of learning technologies. They will produce the promising practices and thoughtful integration models.

Serving these adult education pioneers is the most efficient way to transfer and promote new learning technology. This means that the transfer will be uneven, but it can be systematic. State directors of adult education are identified as collaborators in the Cyberstep product distribution and promotion of Internet products. Each director can define statewide strategies to distribute the learning products and support their use as local circumstances and resources dictate.

Trends and Directions

The following items illustrate trends and goals that help shape our optimism and planning:

- The U.S. Department of Education's National Center for Education Statistics has found that 95 percent of all US schools will have Internet access by 2000, if past rates continue.
- In October of 1989, Vice President Gore called for putting basic voice and data telecommunication services within walking distance of every person on earth within a decade. This call included the creation of a global knowledge network to provide better delivery of education, health care, agricultural resources, sustainable development and public safety.
- Internet based Collaborative Projects – ICPs will grow in importance over the next decade. They allow students and teachers the opportunity and power to exchange ideas, opinions, research, experience, data, expertise, artwork and multimedia presentations on any given theme or topic. Students and teachers are able to share these with a wide range of individuals of different ages, backgrounds, cultures and regions.
- The global classroom – worldwide mediated learning is a reality with courses constructed using subject specialists from around the world.

Adapting these Internet models to adult basic education will be a challenge for the next decade.

- "Just in time learning" – work place education, including remedial and refresher learning, will be common in the 21st century. It will be centered on company level and industry level learning and be delivered via the Internet and/or CD–ROM or digital video disk (DVD).[47] It will permit entry level employees to upgrade their basic skills within the industry or job context. This is especially important when company forms, processes or procedures change.
- With increasing competition among Web portals and content providers for market share, key services and goods such as e-mail, software upgrades, basic information on issues of interest to adult learners will become available at no charge to educational institutions and individual learners.

[47] Technology, Open Learning and Distance Education, A.W. Bates, Routledge Studies in Distance Education, 1995, p. 235

Parallel Development

Parallel development of multimedia products using converging digital technologies can greatly reduce the cost to create and distribute high quality products for low literacy learners.

The Challenge of Obsolete Technology and Media

Historically, the cost of developing multimedia products has been prohibitive, resulting in limited availability of quality instructional material for the highly price-sensitive adult education market. This has been exacerbated by the rapidly changing modes of technology. No sooner does a technology seem to gain market acceptance and enough critical mass to lower prices than it becomes obsolete or some new potentially more powerful technology looms on the horizon.

It may take years for a new technology to reach fruition, if at all. The potential for new standards, hardware and systems that could soon make the products obsolete has inhibited development and forced product prices higher in order to recover development costs over a relatively short product life.[48]

Not all that long ago, it appeared that videotapes would be replaced by laser disks as an instructional tool. The laser disk provided superior image quality and offered rapid random access to any part of the video and facilitated user interaction. Although laser disk technology was powerful, it was also expensive and never reached significant educational market penetration. Relatively few educational products were developed and it will soon be replaced, along with the CD-ROM, by new DVD technology.

With its significantly lower hardware and media costs, it is highly likely that DVD will find its way into many homes and schools, providing developers with a substantial potential market, justifying greater investment in resources to create products. But it is absolutely assured that within a short time, a new more powerful format with significantly increased data storage and faster throughput, requiring new gear and

[48] The product life cycle for instructional video is roughly 10 years. For Instructional Learning Systems (large computer managed instructional systems) it is longer. For stand-alone computer educational products it is roughly 7 – 10 years.

media will emerge to challenge and supplant DVD. What is a developer to do?

Digital Convergence

Fortunately, a parallel trend to changing media formats is the convergence of nearly all data from analog to digital format. Although video and audio tapes continue to be primarily available in analog format, new digital tapes are increasingly available and the source data for the analog tapes can be acquired and stored in digital format. The same is true for pictures and text. Images, sound, video, animation and text in digital form are platform and technology independent assets that can be used in a wide variety of media.

Today, the convergence of presentation media and development tools into a single digital format permits far more cost-effective development and the ability to efficiently repurpose data for multiple products and formats. Once data (text, images, video, sound) are in digital format, they can be readily transferred to paper, tape, videotape, CD-ROM/DVD, or Internet based data and new formats envisioned for the foreseeable future. So in a real sense, we now have the capacity to generate information once and use it many times in many situations. This reality will greatly reduce the short-term costs of developing multimedia products and increase the long-range utility of the data.

Templates and Standardization

A central cost cutting strategy is to create development templates based on standards for course content and assessment, user interfaces, technology tools, and the educational management system.

Creation of templates that can assist project developers and other course content creators is a central goal of the Cyberstep project. The templates will perform three major functions:

- Speed the creation and lower the cost of creating instructional materials by allowing content specialists to enter information into a database that will publish data to a variety of multimedia shells that will support delivery using print, audio tape, videotape, CD-ROMs, DVDs, WWW and WebTV.
- Facilitate use of a consistent user interface that will assist learners to easily navigate through course materials and will allow instructors to mix lessons from compatible courses.
- Lower the development time and cost of creating similar products by educators throughout the country.

These benefits can be derived only if a set of standards are established and followed. Cyberstep Task 2 will focus on the development of these standards, which will include:

- Content standards
- Assessment standards
- Technology standards
- Interface standards
- Management system standards
- Template standards

The following pages identify key issues to be explored by the project partners in the development of these standards.

Content Standards

Although subject matter may vary substantially from one product to another, Cyberstep partners have agreed to develop and follow consistent standards in the creation of course content. These will be based on the partners' understandings of target learners' needs and interests, and how they can best learn and apply new skills.

In developing Cyberstep materials, product designers will give attention to several of the relevant skills and curriculum frameworks that identify knowledge and skills needed for success in 21st century America. Particularly relevant frameworks include both adult education documents and standards developed for secondary school instruction. These include:

- SCANS
- Equipped for the Future
- National Science Education Standards
- National Council of Teachers of Mathematics Standards
- TALS/NALS Framework

Curriculum cross-walks will indicate the most relevant skills areas and specific competencies identified in each of these and other frameworks that are covered in Cyberstep learning materials.

Key questions to be answered in Task 2

- What specific content standards will support the Cyberstep partners' educational philosophy?
- How will the standards and competencies be identified in Cyberstep product documentation?
- How will the standards information made available for developers, teachers, administrators and learners differ from one another?
- How will these standards be incorporated into the product development shells?

Assessment Standards

Acquiring accurate and useful assessment information in a cost-effective manner is an ongoing challenge for all adult educators. Individual assessment and feedback are integral to any learning system, but assessment is potentially time consuming, expensive and difficult to do with distance learning students in both mediated and self-directed learning programs.

There is always a tension between the desire to acquire in-depth data with which to prescribe instruction and measure results, and the realities of working with limited resources and students who are intimidated by testing. The needs for documentation differs substantially between students who are enrolled in a formal program of study and those who are self-learners.

The types of possible assessment using written materials, computer-based materials and forms over the Internet include a variety of basic skills and English proficiency pre-assessments, lesson reviews, and summative evaluations. It is possible to store assessment results and work samples, such as a resume or job application, in an online portfolio accessible to the student and teacher. Various types of simulation exercises can be presented on CD-ROM and, in a more limited fashion, on the Internet.

Because of slow data transmission speeds and unreliable connections, complex interactive assessments (such as real time simulations) are not now practical on the Internet, but they will become increasingly feasible during the life of the project. Determining the type and amount of assessments to make available will depend on a thorough analysis of user and educator needs, available resources, and technical feasibility.

Key questions to be answered in Task 2

- What assessment data will be useful to the teacher, learner and administrator?
- How can it be acquired and reported in an efficient manner?
- How can course content respond to facilitate learning based on assessment results?
- How can institutions be assured that the enrolled student is in fact the person participating in distance learning and completing assignments and assessments?
- How will Cyberstep assessment options relate to standardized assessment frameworks?

Technology Standards

From print and video materials to computer based instruction, the World Wide Web, and WebTV, Cyberstep products will span a broad range of technology used to provide instruction both in and outside of the classroom. In the rapidly changing world of consumer electronics, which is the driver for most technologies used to deliver instruction, it is difficult to predict changes even just a few years in advance.

Five years ago, most people had not heard of the World Wide Web and few if any guessed at its rapid growth. No one really knows how quickly Digital Versatile Disks (DVD) will supplant CD-ROMs but it is almost inevitable. By the year 2006, U.S. broadcast and cable companies are slated to turn off their analog equipment and broadcast only for High Definition Television (HDTV).

Exactly how these factors and the parallel development of two-way cable and interactive television will impact access to instructional materials is anybody's guess, but there is no doubt that the changes will offer multiple opportunities for improved in-home and worksite education. Wireless technologies and software enhancements, faster modems and high density storage devices, low-cost computers and specialized "digital appliances" (such as interactive electronic books) all will provide opportunities for new and effective educational products.

Recognizing that it is impossible to develop for all of the potentially emerging technologies, we have determined that our products will cover print, video, CD-ROM, WWW and WebTV technologies. We will evaluate the advantages of DVD in relation to CD-ROM and we will look at other interactive TV options similar to WebTV as potential alternative technologies. We will establish specific format standards for all technologies used to guide product developers.

Key questions to be answered in Task 2

- How available are various technologies to targeted learners today and in the foreseeable future?
- What technology trends may impact availability and cost of various technologies over the next decade?
- How might these trends impact product capabilities and production techniques?
- What production standards will apply to each of the technologies?

Interface Standards

"Interface" defines the look and feel of products from a user's perspective. Whether it's the quality of a video or how text is displayed on the television screen; how a learner navigates through web pages or what the buttons look like; a product's interface contributes substantially to the user's experience. The interface can significantly influence whether a learner has a positive or negative experience.

Aesthetics and quality of design play a critical role in how a user judges overall product quality and perceived value. Playful discovery and facilitated mastery of program elements can also enhance the experience. We are committed to creating attractive products that are fun and rewarding to use. To this end, we are particularly concerned about the logic and consistency of navigation as well as look and feel both within and between products.

Products targeted to different groups and addressing different learning needs, will invariably require unique design considerations. But in order to facilitate mixing lessons from various Cyberstep products and using standardized development templates, we will determine which elements are to remain the same or similar in all products. This will invariably constrain some creativity but it is a necessary trade-off to increase overall functionality and cost-effectiveness of the products.

Key questions to be answered in Task 2

- What basic design principles do we consider to be essential for successful quality human interaction with the various media?
- What are the elements of product interface designs that need to be consistent?
- What elements can be readily changed without interfering with the overall logic of the interface design?
- How can users modify the interface to reflect their individual aesthetic sensibilities and reinforce issues of individual power and choice?
- What is the role of metaphor in our product designs and what metaphors are appropriate for various subgroups within the target learner group?
- How can we best facilitate direct manipulation of product elements in simulations and navigation?

Management System Standards

Most Cyberstep products may be used as stand-alone learning tools, but they will be designed to be integrated into an organization's own curriculum and tracking systems. The Internet and WebTV ESL and ABE products will be designed with a built-in management system to track learner participation and progress. The management system will perform a variety of functions related to planning instruction and tracking student performance. The system will be flexible enough to be of use to individual self-directed learners and organizations that support informal adult learning, as well as educational institutions.

Key elements of the system will include:

- Learner information
- Teacher and facilitator information
- Educational institution information
- Course content sequencing
- Student activity tracking
- Student performance tracking
- Individual and summary activity and performance reports
- Learner portfolio

Key questions to be answered in Task 2

- What types of learner and course information are desired by educational institutions?
- How can the system relate to assessment and assist in sequencing learning modules?
- How can the system assure data security in terms of accuracy and privacy?
- How will the internet management system relate to documentation for ADA and other institutional performance criteria?

Template Standards

Product templates will expedite development and help ensure consistent adherence to product standards. In some cases, these will be simple styled document templates. In others, the templates will be complex front-ends to databases and other programs that are active tools in the production process. Templates will assist course developers to:

- Plan courses
- Track production
- Create written course materials
- Create written and on-line documentation
- Create storyboards for video production
- Create interactive multimedia presentations for CD-ROM/DVD
- Create pages to be accessed over the Internet
- Create pages that support enhanced WebTV delivery
- Create assessments and tests

To be useful, the templates themselves must adhere to specific standards that reflect all of the other content and design standards. The templates will be created during Task 2 based on a continuing dialog between partners; learners, teachers and school administrators; focus groups; and pilot testing. Developed and refined to support Cyberstep product creation activities, the templates will be made available to the public for ongoing product development at the end of the project.

Key questions to be answered in Task 2

- What production elements lend themselves to standardization and the use of templates?
- What tools will be used to create the templates?
- How will the templates be accessed and who will have access?
- How will the templates be modified and who will modify them?
- How will the templates relate to other tools that will facilitate storage and conversion of digital data?